

Atlantic Richfield Company

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December 1, 2010

Ms. Jacquelyn Hayes
Remedial Project Manager
U.S. Environmental Protection Agency - Region 9
75 Hawthorne Street SFD-8-2
San Francisco, California 94105

Subject: Revised Dust Suppression Plan for Inactive Evaporation Ponds, Yerington Mine Site; Administrative Order on Consent, EPA Region 9 CERCLA Docket No. 09-2009-0010

Dear Ms. Hayes:

Atlantic Richfield Company (ARC) has prepared this revised Dust Suppression Plan (DSP - Revision 1) for the inactive Anaconda evaporation ponds (ponds) at the Yerington Mine Site (Site) in response to a request presented by the U.S. Environmental Protection Agency - Region 9 (EPA) in correspondence to Atlantic Richfield Company (ARC) dated August 18, 2010. The ponds include the Unlined Evaporation Pond (UEP) and the Lined Evaporation Ponds (LEP). This revised DSP is required under the Administrative Order on Consent (AOC) and attached Scope of Work¹ (SOW) dated April 21, 2009.

The revised DSP (Revision 1) has been uploaded to the Tetra Tech/EPA Anaconda Document Library (SharePoint Partners Website <https://partners.ttemi.com/sites/epanevada/default.aspx>) in the folder entitled **Dust Suppression Plan Revision 1 Dec 2010**.

The purpose of this revised DSP is to describe an interim measure intended to suppress fugitive dust that may originate from the UEP and LEP until the interim covers on these ponds can be accomplished pursuant to the removal action described in the AOC/SOW. Potential interim cover materials for the UEP and LEP are currently being characterized. ARC anticipates that the interim covers for these ponds could be constructed starting in the second or third quarter of 2011, pending the selection and EPA approval of appropriate cover materials. The locations of the UEP and LEP are depicted in Figure 1.

¹ Administrative Order on Consent and Settlement Agreement for Past Response Costs Anaconda Copper Mine, Yerington Nevada; U.S. EPA Region IX; CERCLA Docket No. 09-2009-0010.



Existing Pond Conditions

The ponds were characterized by ARC in 2008 and 2009, resulting in the *Anaconda Evaporation Ponds Removal Action Characterization Data Summary Report* (RAC DSR) dated October 15, 2009 (Brown and Caldwell, 2009a). The RAC DSR is currently under EPA review. The UEP and LEP are described below:

Unlined Evaporation Pond (UEP)

The UEP consists of a large northern section (98 acres) and a much smaller southern section (4.1 acres), with about half of the northern section and all of the southern section located on BLM property. The estimated volume of pond sediments contained in the UEP is approximately 270,230 cubic yards based on an average thickness of approximately 1.5 feet in the large northern section and about five feet in the small southern section. The UEP was constructed on alluvial soils without a liner, exhibits a relatively flat undulating surface, is surrounded by berms constructed of vat leach tailings (VLT) materials, and generally conforms to the slope of the pre-disturbance terrain.

Sediments within the UEP exhibit some chemical variability, but are generally homogeneous with respect to physical properties. For example, sediments on the surface to approximately three inches below the surface are typically dry. Below about three inches, the sediments are typically slightly moist with no wet or saturated intervals. The sediments are relatively firm and generally do not pond water after precipitation events. Approximately 105 used truck tires originally reported for use as embankment stabilization have randomly been redistributed to the central portion of the UEP.

Lined Evaporation Pond (LEP)

The LEP includes three cells (North, Middle and South), which were lined with a relatively thin (approximate 0.5 to 1 inch remaining thickness) asphalt liner (a mixture of asphalt tar and crushed gravel) similar to road paving. The asphalt liner was placed on a sub-base consisting of 1 to 2.5 feet of VLT materials. The LEP is mostly located on BLM property, with a small portion on the west side located on private property. The LEP, excluding the Weed Heights sewage lagoons, has a total combined area of approximately 101 acres. The southwest area of the LEP contains a well established berm that separates the active Weed Heights Sewage Ponds from the LEP (the Weed Heights Sewage Ponds consist of three lined lagoons with no evident discharge). The volume of pond sediments contained in the LEP is approximately 65,800 cubic yards, based on an approximate average sediment thickness of 0.4 feet.

The LEP appears to have been constructed as a single lined surface, which was subsequently subdivided into three sections by the construction of two embankments (gravel roads constructed of VLT materials) across the pond liner. This conclusion is supported by the absence of liner material on the sides of the embankments and the presence of the asphalt liner encountered in boreholes drilled through the embankments. The northern embankment is used as an access road for the northern set of pumpback wells used to extract groundwater from the underlying shallow hydrostratigraphic zone of the alluvial aquifer.

Exposed asphalt liner that has deteriorated (i.e., cracking and peeling) occurs within the western portion of the LEP, adjacent to an irregular berm, and in other areas where it exhibits solar radiation damage. The liner appears to be intact (i.e., not significantly cracked, peeled or degraded by sunlight at locations where the overlying sediments have been excavated, or penetrated by characterization boreholes) in areas covered with thicker sediments (i.e., greater than 0.3 - 0.4 feet thick). The average thickness of the pond sediments is estimated to be approximately 0.4 feet thick, with a maximum measured thickness of approximately one foot in select areas within the central, topographically lower portion of the LEP. This topographically low area exhibits near-saturated sediments associated with the seasonal occurrences of low-pH standing water to be mitigated as part of the removal action. This 'wet' area will require a thicker interim cover than peripheral portions of the LEP.

The LEP surface elevation varies from less than 4,352 feet above mean sea level (amsl) to approximately 4,358 feet amsl along the western perimeter. The berm separating the North and Middle Cells that contains the northern pumpback wells is approximately 30 feet wide and 14 feet high, and will remain intact during the removal action. The berm separating the Middle and South Cells is relatively rounded on top (the top exhibits a variable width), is approximately four to six feet above the LEP sediment/liner level, and contains a Bird Gard location for avian wildlife mitigation.

Envirotac Information and Application

ARC has identified a polymer spray dust suppressant, Envirotac II (Envirotac), which will provide a temporary (nominal 18 month) period of dust mitigation for the ponds. This product would be applied by Environmental Products and Applications, Inc. (EP&A; located in Palm Springs, California), as described below. Additional information about EP&A and Envirotac is presented in Attachment 1. Envirotac has been successfully used by ARC on mine tailings as a dust suppressant, with an effective performance period of up to 18 months, and has been approved by EPA - Region 8 for suppressing dust at the Opportunity Ponds (former tailings impoundment), located northeast of Anaconda, Montana (Attachment 2).

Envirotac is a proprietary non-hazardous acrylic polymer manufactured by EP&A that, when applied to a soil surface such as the pond sediments, will penetrate the surface and, upon drying, will form a permeable resin bond that will bind the soil particles together (sufficient permeability to allow meteoric water to infiltrate through the surface application). Based on the Site visit conducted by EP&A, and EP&A's experience using Envirotac at the former Anaconda Opportunity Ponds facility near Anaconda, Montana: 1) EP&A anticipates that a light application of Envirotac will result in an effective dust suppressant and will allow water and air to penetrate the surface; 2) the dust suppressant should remain effective for up to 18 months, and 3) EP&A will warranty the product's performance for one year after its application. This type of polymer cannot be applied to saturated or near-saturated pond sediments because water is the media for application and, in order for the polymer to cure, the application must be allowed to dry. In addition, although no specific information is available on the interaction of low-pH fluids and the polymer, low-pH fluids may adversely impact the performance of the polymer if such contact were to occur after the application.

EP&A will use a Terragator with flotation tires and a 2,000-gallon tank to apply the polymer within the LEP and UEP (tracked vehicles will not be used for the application of Envirotac II on the UEP and LEP). As described in the Draft Implementation Work Plan for the Anaconda Evaporation Ponds Removal Action dated November 4, 2009 (Brown and Caldwell 2009b), geotechnical (shear testing) analysis of the LEP and UEP sediments results indicated that higher ground pressure vehicles (i.e., in excess of 50 to 60 psi) would have the potential to get stuck or at a minimum, significantly slow the application process. Higher ground pressure equipment may potentially require a road base or towing to maintain production in the softer areas of the UEP or portions of the LEP adjacent to the areas of seasonal ponding.

Once inside the ponds, the rubber-tired Terragator will be filled from the pond margins, and will not need to be decontaminated until all pond-interior application activities are completed (i.e., if required, the Terragator will likely only need to be decontaminated twice, once when exiting the UEP and once when exiting the south cell of the LEP). EP&A will furnish a rumble plate to shake loose any pond sediments from the tires or chassis of the Terragator and, if required, a high-pressure hose will be used to spray the underside of the Terragator prior to it exiting the pond or pond cells (i.e., any washed sediments will remain in the pond).

A 4,000-gallon water truck will support the application (the water truck would only be positioned on proximal berms around the ponds). Once applied, Envirotac leaves a surface sheen that can be visually monitored to determine application progress and adequacy of the spray-on coverage (the sheen that can be visually monitored is a glossy sheen, similar to a lamination). ARC will perform visual monitoring at frequency (about 4 times per day) that is consistent with the application rate, described below, and summarize application progress on a daily basis.

The polymer will be sprayed on by mixing with water in a ratio that is compatible with the applicator equipment speed. For the application to the ponds, EP&A has proposed to use approximately 150 gallons of Envirotac per acre, applied with a mixing ratio of 1 part product to 8 parts water. For areas that may not be accessible with the Terragator, EP&A will spray the product from the berms adjacent to the inaccessible areas, including some portion of the saturated or near saturated portions of the LEP. This information is also presented in Attachment 1. Material safety data sheets (MSDS), and associated information for Envirotac including laboratory geochemical and toxicity test results, are provided in Attachment 1.

The water to be used in the application will come from the water stand constructed for the current removal actions (transite pipe, radiological soils and interim evaporation pond covers). The supply well for construction water is WW-36B, which is also the Weed Heights Community drinking water supply well. The potable water that is pumped from this well meets all Federal maximum contaminant levels (Brown and Caldwell, 2010). The light application of Envirotac described in this revised DSP will not result in ponding, given that the product is sprayed on, cures by evaporation, and dries when exposed to air. Envirotac, like other similar products, is permeable and will allow meteoric water to percolate through the surface application. The product will be applied from a 2,000-gallon capacity tank at an average rate of 5 acres per hour, which will result in a total of approximately 138 tanks for the application and approximately 42 hours of direct application time (i.e., not including set-up, tank or water truck re-filling, etc.).

If the information provided in this revised DSP is not sufficient for EPA to approve the use of Envirotac in suppressing dust in the LEP and UEP, a nominal 1-acre pilot test of the polymer may be performed prior to full-scale application of Envirotac. If necessary, ARC will work with EPA to develop a test program prior to full scale application to demonstrate this product. Given that Envirotac has a neutral pH, it is not anticipated to change the characteristics of, or create an adverse reaction with, the pond sediments. Geochemical characteristics and lab test results, including toxicity testing, of the polymer are provided in Attachment 1. If EPA determines that the product is not compatible with the pond sediments, the nominal 1-acre area can be disked to break the Envirotac bond and promote degradation of the polymer under ambient Site conditions. The polymer naturally degrades when exposed to bacteria, ultraviolet (UV) light and climate conditions expected at the Site. As indicated in Attachment 1, Envirotac is not expected to produce hazardous or toxic degradation products. Therefore, the disked test area can remain in place.

Health and Safety

All dust suppression and related activities will be performed in accordance with the updated Health and Safety Plan for the Site dated 2009 (Brown and Caldwell, 2009c) and EP&A's Job Safety Handbook (Attachment 3). Health and safety hazards associated with the activities described in this DSP have been evaluated and documented in the Work Risk Assessment (WRA) provided as Attachment 3, and summarized in the following table:

Work Risk Assessment Summary	
Field Activities	Potential Hazards
Mobilize equipment and materials to Site	<ul style="list-style-type: none">Highway driving hazards.Hazards associated with operation of forklift and material handling.
Preparing dust suppressant (Envirotac) in applicator tank	<ul style="list-style-type: none">Hazards associated with operation of water truck and Terragator on mine roads, and within or around pond embankments.Skin or eye contact with Envirotac chemicals from spill, splash or spray could cause irritation.Electrical hazards with operation of pumps.
Spray application on UEP	<ul style="list-style-type: none">Hazards associated with operation of Terragator on pond embankments or rough terrain on ponds.Terragator could become stuck in soft pond sediments.Contact with or inhalation of dust from pond sediments.Contact with diluted Envirotac chemicals.
Spray application on LEP	<ul style="list-style-type: none">Exposure to low pH acidic water in areas of ponded water or saturated sediments could cause acid burns to skin or eyes.
Decontamination of Terragator	<ul style="list-style-type: none">Exposure to high pressure water stream from pressure washer.Potential contact with pond sediments in decon water.

Standard site personal protective equipment (PPE) shall be required for this work activity, including hard hat, safety glasses, hard-toe boots, long-sleeve shirts, high-visibility clothing and appropriate gloves. Additional PPE may be requested depending on Site conditions and respiratory protection may be required if dusty conditions are present.

Schedule

ARC will implement the DSP after the current removal actions are completed, and as soon as weather conditions permit. Application of the polymer requires the following for maximum efficiency and curing: 1) dry soil conditions (i.e., no rain or snowfall) for a period of 72 hours before, and 24 hours after, the application; and 2) a minimum temperature of 41°F during and after the application (this minimum temperature applies to both day and night temperatures). Although a precise schedule will depend on the weather, ARC anticipates that optimal climate conditions for the application will become available in May 2011 based on the following information available from the Yerington weather station (Station 269229), as reported by the Western Regional Climate Center (WRCC) for the period of record from 3/1/1894 to 7/31/2010:

Average Site Monthly Climate Conditions												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Average Maximum Temperature (°F)	46.1	52.6	59.7	67.1	75.1	83.7	92.2	90.9	83.0	70.8	56.8	47.1
Average Minimum Temperature (°F)	17.7	22.5	27.0	32.4	40.2	46.7	52.5	50.2	42.1	33.1	23.4	17.8
Average Total Precip. (inches)	0.57	0.53	0.42	0.41	0.63	0.47	0.26	0.25	0.24	0.34	0.42	0.51

Pending EPA's approach to performing a pilot test of the polymer application, as discussed above, full-scale implementation of the DSP could occur as soon as late May or early June 2011. ARC anticipates that discussions with EPA on the precise timing of full-scale implementation of the DSP will occur after approval of this DSP, and will include the following elements: 1) Site weather conditions (e.g., moisture on the pond surfaces), and the ability for EP&A to perform the work safely; and 2) the potential for fugitive dust to be generated prior to the timing of placing interim covers on the LEP and UEP.

References

Brown and Caldwell, 2009a, Anaconda Evaporation Ponds Removal Action Characterization Data Summary Report - Revision 1. Prepared for Atlantic Richfield Company. October 15.

Brown and Caldwell, 2009c, Site-Wide Health and Safety Plan - Revision 1. Prepared for Atlantic Richfield Company. December 21.

Brown and Caldwell, 2009b, Draft Implementation Work Plan for the Anaconda Evaporation Ponds Removal Action, Yerington Mine Site. Prepared for Atlantic Richfield Company. November 4.

Brown and Caldwell, 2010, Implementation Work Plan - Revision 3 for the Anaconda Evaporation Ponds Removal Action (Thumb Pond and Sub-Area A), Yerington Mine Site. Prepared for Atlantic Richfield Company. October 25.

Ms. Jacquelyn Hayes
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If you have any questions regarding this revised Dust Suppression Plan for the inactive Anaconda evaporation ponds (LEP and UEP), please contact me at (714) 228-6774 or via e-mail at jack.oman@bp.com.

Sincerely,



Jack Oman
Project Manager

cc: Dave Seter, EPA
Jere Johnson, EPA
Roberta Blank, EPA
Tom Dunkelman, EPA
Joe Sawyer, NDEP (Hard Copy)
Tom Olsen, BLM (Hard Copy)
Paul Meyer, BLM
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Peggy Pauly, YCAG (Hard Copy)
Lyon County Library System Central (Hard Copy)
John Hadder, GBRW
Susan Juetten, GBRW

Figure



NOTES:

1. PROJECTION: NEVADA STATE PLANE, WEST ZONE, 1927 NORTH AMERICAN DATUM (FEET)
2. BASE PHOTO TAKEN OCTOBER 2001



Date: Nov. 2010

Atlantic Richfield
Company

Project: 138555

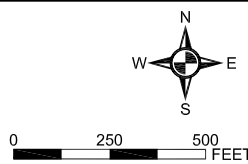


Figure 1

Evaporation Pond Locations

Attachment 1



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"Your company has a long tradition of supporting the U.S. military, and I want you to know we appreciate the superb support."

- J. Gostel



Product Information

Envirotac II is a unique dust and erosion control product. When applied to the surface or mixed in with any soil, it will penetrate and extend down into the soil to create a tough layer of protection. Upon drying, Envirotac II binds the soil's particles together by forming a clear, plastic and resin bond.

The level of Envirotac II protection is determined by the amount used for each application. Light applications of Envirotac II are effective for cementing soil particles together for dust and erosion control while allowing water and air to still penetrate the surface. Heavier applications build durable and water proof surfaces. This hard surface is flexible and can even withstand the demands of vehicle traffic. This makes Envirotac II a cost-effective alternative treatment for unpaved roads.

Not only do we manufacture and distribute Envirotac II globally, we also help by consulting, and planning.

Envirotac II is proven to be one of the most cost-effective and best performing dust treatments, in comparison to other materials and water. Envirotac II is approved as non-toxic and environmentally safe.



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Mines

Our Company Environmental Products and applications has a long history with the Mining Industry. It was US Borax, in Boron, CA that pretty much gave us our start 16 years ago. Since then we do over a thousand acres of tailings a year and our product Envirotac II has been sprayed over 50,000 acres of tailings. In all of our experiences we have never had to go back due to failure. Through our contacts in the mining industry we have engineered various types of equipment from hydroseeders to floatation tractors (capable of spraying over 40 acres per day) specially designed to withstand the challenging environment that tailings present. Our product has also been used exclusively on haul roads to reduce dust and water consumption with out the side effects presented by a mag chloride and such. Please feel free to contact us for mining references.



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Dust Control Test Results Summary (Envirotac II)

Recommended at Marine Corps Base at Twentynine Palms following unbiased tests

Study Goal: Clean Air Act Compliance

With the goal of reducing particulate matter to levels in compliance with the Clean Air Act, the Marine Corps Air Ground Combat Center located at Twentynine Palms, CA is implementing measures to control dust generated from vehicular traffic on unpaved roadways and other areas of concern.

Selection of Products to Test

The Naval Facilities Engineering Service Center put considerable effort into developing and implementing an equitable test of dust suppression products. In January 1997, information was solicited from interested companies and products were ranked in terms of material and labor cost and equipment requirements. Envirotac II was among the five top ranking products for further evaluation.

Bench Scale Test Methods and Results

Test protocol consisted of both bench scale and field-testing. bench scale testing involved the implementation of six test beds, one for an untreated baseline and the others for the first selected products. Each test bed consisted of soil placed within a concrete containment system; a hydraulically powered test wheel to simulate a vehicle tire rolling over soil, and dust recovery system that isokintically collected the dust generated. Envirotac II from Environmental Products was the most effective dust control product, showing 97% improvement over the untreated baseline. The second most effective product showed a 90% improvement, and the others were considerably less effective.

Field Test Methods and Results

In the field tests, Envirotac II and the second ranking product were applied on sections of an unpaved roadway. A representative from Environmental Products and Applications applied two passes of Envirotac II from a 800 gallon towable tank; the other product required two workers, a computer controlled sprayer/water truck, and three applications. The roadway was opened for traffic after four hours of curing, at which time both products were suppressing dust. After twenty-eight days, however, the surface treated with Envirotac II had developed half as many ruts as the surface treated with the other product.

Economic Analysis and Environmental Acceptability

Econometric analysis of the two tested products and of more conventional means (including covering an unpaved roadway with asphalt, soil cement stabilization, and waste application) indicated that Envirotac II had the lowest seven year cumulative cost. Envirotac II was also determined to have no contaminant levels exceeding the TCLP limits, to pose no risks to health or to the environment, and to not be considered a hazardous waste if removed.

Recommendation

As a result of this evaluation, Envirotac II was recommended for use on unpaved roadways with rubber tired vehicle traffic, and in open areas at the Marine Corps Air Ground Combat Center, Twentynine Palms, California.

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Question Topics	Answer
Prices	As the manufacturer of Envirotac II, we offer factory direct prices. Envirotac II is priced per gallon/liter.
Discounts	Discounts are based on volume. Substantial discounts are available with full truckloads (4,400 gallons +)
Payment Terms	COD or Net 30 on approved credit
Payment Method	We accept cash, checks, Visa, Master Card, an all Government Procurement Cards
Bids/Proposals	We can provide material supply, shipping, consultation and application for any size project. Contact us today for accurate project costs. Formal bids and proposals are available.
Minimum Order	Envirotac II can be purchased in volumes as small as 55 gallon (208 L) drums.
Envirotac I & II	Envirotac I is the premium high solids (51 - 55% version of Envirotac II (39-43%)
Availability	30,000 gallons (113,000 L) of Envirotac II are available on an immediate basis.
Cure Time	Envirotac II will cure within 2-24 hours depending on the temperature.
Penetration Depth	Normal surface treatment penetrates 3/4" (2cm) deep. Application method, soil type and compaction are the determining factors.
Cold Weather	Cold weather will increase cure times.
Freezing	Freezing Envirotac II is not recommended. Polymers will coagulate and decrease the original strength.
Shipping	Envirotac II can be shipped anywhere in the U.S. and to any shipping port internationally.
Dry Form	Envirotac II is a concentrated liquid and cannot be produced in dry form.
Performance Factors	The following factors determine how long Envirotac II will perform: <ul style="list-style-type: none"> • Amount of Envirotac II used (coverage rate) • Depth of Penetration/Treatment • Degree of Soil Compaction • Type of Soil • Volume & Weight of Vehicle Traffic
Normal Life Span	Unpaved Roads: 12 - 24 months+ Dust Control: 12 - 16+ months We can custom design longer/shorter periods as needed.
Follow-up Applications	Once performance has reached the limits of its longevity, a follow-up application is necessary to restore and rejuvenate its optimal performance. Reapplying Envirotac II to a previously treated area requires usually only 20% of the original application amount to achieve the same results.
Soil Type	Envirotac II will perform with any soil type. Different soils require different application rates.
Salt Water Dilution	Envirotac II is designed to be diluted with fresh water. Salt water dilution is not recommended. Salt water will chemically weaken the original strength.
Rain/Precipitation	Envirotac II does not dissipate (wash away) with rain. Heavier concentrations, will actually waterproof the treated surface.
Decreased Application Rates	Decreasing the application rate (increased coverage) will result in reduced strength, longevity and performance.
Cleaning	Envirotac II is water-soluble. Application equipment should simply be rinsed out after use. Cured (hardened) Envirotac II is still water-soluble but requires some effort.
Distributors	We do not offer exclusive distributorships. However, significant discounts are available for large volumes.
Hydro-seeding	A hydroseeder is recommended to mix and apply seed, mulch and Envirotac II together.



Equipment List for dust control application **over Yerington Mine Tailings**

2,000 gallon capacity Terragator: This specially designed Terragator uses floatation tires to travel over tailing areas that water trucks cannot. The application method will be to fill the Terragator's tank with approximately 1,775 gallons of water. We will then add 225 gallons of Envirotac II acrylic polymer. The solution will self mix, no agitator is needed. The Envirotac II solution will then be applied at a flow rate of 300 gallons per minute. The 2,000 gallons of solution will treat approximately 1.75 acres. This vehicle is equipped with a suction pump that allows it to suck the Envirotac II out of the pump and into the vehicle. It also allows the vehicle to pump out the solution via an attached hose. We will use the hose application in "soft" areas and apply the Envirotac II solution to spots that our technicians deem to be too difficult to navigate the Terragator through.

4,000 gallon capacity Water Truck: The Water Truck will be used to transport water from the water source to the Terragator. This will save time as the Terragator will not have to travel as far to refill with water. The Water Truck will not travel on the tailing ponds.

Forklift: We will use the forklift to transport the 250 gallon totes of Envirotac II to area that the Terragator will be refilling at. This will save time by reducing the travel the Terragator would have to go to refill with Envirotac II.



Envirotac II application FAQs for Yerington Mine

Application rate: We will apply 150 gallons of Envirotac II per acre (43,560 sq. ft.)

Application Mixture: Envirotac II will be mixed at a rate of 150 gallons concentrate to 8 parts (1,200 gallons) water per acre (43,560 sq. ft.)

How long will the Envirotac II application successfully treat the Yerington Mine application?:
The Envirotac II application will treat the Yerington mine site from fugitive dust for 12 to 18 months. Environmental Products and Applications will guarantee the application for 12 months and reapply to areas that are no longer offering sufficient dust suppression at no additional charge. This does not include fugitive dust that has settled on top of treated areas.

How long will it take Environmental Products and Applications to treat 210 acres?: It will take no longer than three weeks to successfully treat 210 acres.

Will the Envirotac II application generate any additional waste to the Yerington mine site?:
No, the application will not generate any additional waste to the Yerington mine site. Environmental Products will take all empty containers with them upon the job completion.

Envirotac II®

Material Safety Data Sheet (page 1/4)

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Envirotac II® Soil Stabilizer

MSDS Date: 3/22/00

COMPANY IDENTIFICATION

Vermillion's Environmental Products & Applications, Inc. (EP&A, Inc.)
73-710 Fred Waring Drive, Suite 220 Palm Desert, CA 92260

Envirotac® is a registered trademark of Vermillion's Environmental Products and Applications, Inc.

EMERGENCY TELEPHONE NUMBERS

HEALTH EMERGENCY (760) 779-1814

SPILL EMERGENCY (760) 779-1814

2. COMPOSITION/INFORMATION ON INGREDIENTS

No.		CAS REG NO	WEIGHT (%)
1	Acrylic polymer	Not Hazardous	39-43
2	Individual residual monomers	Not Required	<0.1
3	Aqua ammonia	1336-21-6	<1.0
4	Water 7732-18-5	57-61	

See SECTION 8, Exposure Controls / Personal Protection

3. HAZARDS IDENTIFICATION

Primary Routes of Exposure Inhalation, Eye Contact and Skin Contact

Inhalation Inhalation of vapor or mist can cause the following: -headache -nausea -irritation of nose, throat, and lungs

Eye Contact Direct contact with material can cause the following: -slight irritation

Skin Contact Prolonged or repeated skin contact can cause the following: -slight skin irritation

4. FIRST AID MEASURES

Inhalation Move subject to fresh air.

Eye Contact Flush eyes with water. Consult a physician if irritation persists.

Skin Contact Wash affected skin area thoroughly with soap and water. Consult a physician if irritation persists.

Ingestion If swallowed, give 2 glasses of water to drink. Consult a physician. Never give anything by mouth to an unconscious person.

5. FIRE FIGHTING MEASURES

Flash Point Noncombustible

Auto-ignition Temperature Not Applicable

Lower Explosive Limit Not Applicable

Upper Explosive Limit Not Applicable

Unusual Hazards Material can splatter above 100C/212F. Dried product can burn.

Extinguishing Agents Use extinguishing media appropriate for surrounding fire.

Personal Protective Equipment Wear self-contained breathing apparatus (pressure-demand NIOSH approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal Protection Appropriate protective equipment must be worn when handling a spill of this material. See SECTION 8, Exposure Controls/Personal Protection, for recommendations. If exposed to material during clean-up operations, see SECTION 4, First Aid Measures, for actions to follow.

Procedures Keep spectators away. Floor may be slippery; use care to avoid falling. Contain spills immediately with inert materials (e.g. sand, earth). Transfer liquids and solid diking material to separate suitable containers for recovery or disposal.

CAUTION: Keep spills and cleaning runoff out of municipal sewers and open bodies of water.

Envirotac II®

Material Safety Data Sheet (page 2/4)

7. HANDLING AND STORAGE

Storage Conditions Keep from freezing; material may coagulate. The minimum recommended storage temperature for this material is 1C/34F. The maximum recommended storage temperature for this material is 49C/120F.

Handling Procedures Monomer vapors can be evolved when material is heated during processing operations. See SECTION 8, Exposure Controls/Personal Protection, for types of ventilation required.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limit Information

No.		CAS REG NO	WEIGHT (%)
1	Acrylic polymer	Not Hazardous	39-43
2	Individual residual monomers	Not Required	<0.1
3	Aqua ammonia	1336-21-6	<1.0
4	Water	7732-18-5	57-61

Comp.		EP&A, Inc.		OSHA		ACGIH	
No.	Units	TWA	STEL	TWA	STEL	TWA	STEL
1		None	None	None	None	None	None
2		a	a	a	a	a	a
3	ppm	25 b	35 b	None	35 b	25 b	35 b
4		None	None	None	None	None	None

- a... Not Required
b... As Ammonia
c... Ceiling
d... OSHA Specifically Regulated

Respiratory Protection A respiratory protection program meeting OSHA 1910.134 and ANSI Z88.2 requirements or equivalent must be followed whenever workplace conditions warrant a respirator's use. None required if airborne concentrations are maintained below the exposure limit listed in 'Exposure Limit Information'. For airborne concentrations up to 10 times the exposure limit, wear a properly fitted NIOSH approved (or equivalent) half-mask, air-purifying respirator. Air purifying respirators should be equipped with NIOSH approved (or equivalent) ammonia/methylamine cartridges and N95 filters. If oil mist is present, use R95 or P95 filters.

Eye Protection Use safety glasses with side shields (ANSI Z87.1 or approved equivalent). Eye protection worn must be compatible with respiratory protection system employed.

Hand Protection The glove(s) listed below may provide protection against permeation. Gloves of other chemically resistant materials may not provide adequate protection: - Neoprene

Engineering Controls (Ventilation) Use Local exhaust ventilation with a minimum capture velocity of 100 ft/min. (0.5 m/sec.) at the point of vapor evolution. Refer to the current edition of Industrial Ventilation: A Manual of Recommended Practice published by the American Conference of Governmental Industrial Hygienists for information on the design, installation, use, and maintenance of exhaust systems.

Other Protective Equipment: Facilities storing or utilizing this material should be equipped with an eyewash facility.

Envirotac II®

Material Safety Data Sheet (page 3/4)

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Milky
Color	White
State	Liquid
Odor Characteristic	Ammonia odor
PH	5.0 to 9.5
Viscosity	1500 CPS Maximum
Specific Gravity (Water = 1)	1.0 to 1.2
Vapor Density (Air = 1)	<1 Water
Vapor Pressure	17 mm Hg @ 20°C/68°F Water
Melting Point	0°C/32°F Water
Boiling Point	100°C/212°F Water
Solubility in Water	Dilatable
Percent Volatility	57to 61% Water
Evaporation Rate (Bac = 1)	<1 Water

The physical and chemical data given in Section 9 are typical values for this product and are not intended to be product specifications.

See Section 5, Fire Fighting Measures

10. STABILITY AND REACTIVITY

Instability	This material is considered stable. However, avoid temperatures above 177C/350F, the onset of polymer decomposition. Thermal decomposition is dependent on time and temperature.
Hazardous Decomposition Products	Thermal decomposition may yield acrylic monomers.
Hazardous Polymerization	Product will not undergo polymerization.
Incompatibility	There are no known materials which are incompatible with this product.

11. TOXICOLOGICAL INFORMATION

Acute Data	No Toxicity data are available for this material. The information shown in SECTION 3, Hazards Identification, is based on the toxicity profiles for a number of acrylic emulsions that are compositionally similar to this product. Typical data are: Oral LD50.....rat.....>5000 mg/kg Dermal LD.....rabbit.....>5000 mg/kg Skin irritation.....rabbit.....practically non-irrupting Eye irritation.....rabbit.....inconsequential irrational
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12. ECOLOGICAL INFORMATION

No Applicable Data

13. DISPOSAL CONSIDERATIONS

Procedure	Coagulate the emulsion by the stepwise addition of ferric chloride and lime. Remove the clear supernatant and flush to a chemical sewer.
Landfill or incinerate remaining solids in accordance with local, state and federal regulations.	

14. TRANSPORT INFORMATION

US DOT Hazard Class.....NONREGULATED

Envirotac II®

Material Safety Data Sheet (page 4/4)

15. REGULATORY INFORMATION

Workplace Classification... This product is considered non-hazardous under the OSHA Hazard Communication Standard (29CFR 1910.1200).

This product is not a 'controlled product' under the Canadian Workplace Hazardous Materials Information System (WHMIS).

SARA TITLE 3: Section 311/312 Categorizations (40CFR 370)..... This product is not a hazardous chemical under 29CFR 1910.1200, and therefore is not covered by Title III of SARA

SARA TITLE 3: Section 313 Information (40CFR 372)..... This product does not contain a chemical which is listed in Section 313 at or above de minimis concentrations.

CERCLA Information (40CFR 302.4)..... Releases of this material to air, land, or water are not reportable to the National Response Center under the Comprehensive Environmental Response, Compensation, Liability Act (CERCLA) or to state and local emergency planning committees under the Superfund Amendments and Reauthorization Act (SARA) Title III Section 304.

Waste Classification..... When a decision is made to discard this material as supplied, it does not meet RCRA's characteristic definition of ignitability, corrosively, or reactivity, and is not listed in 40 CFR 261.33. The toxicity characteristic (TC), however, has not been evaluated by the Toxicity Characteristic Leaching Procedure (TCLP).

United States..... All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

Pennsylvania..... Any material listed as "Not Hazardous" in the CAS REG NO. column of SECTION 2, Composition/Information On Ingredients, of this MSDS is a trade secret under the provisions of the Pennsylvania Worker and Community Right-to-Know Act.

16. OTHER INFORMATION

HMIS Hazard Ratings..... HEALTH = 1, FLAMMABILITY = 0, REACTIVITY = 0.

PERSONAL PROTECTION: See Section 8, Exposure Controls/Personal Protection for recommended handling of material as supplied; check with supervisor for your actual use condition.

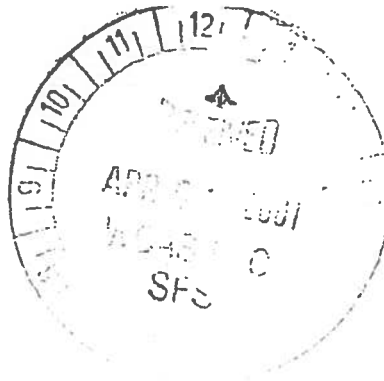
Scale: 0 = Minimal, 1 = Slight, 2 = Moderate, 3 = Serious, 4 = Severe

* = Chronic Effects (See Section 3, Hazards Identification)

HMIS is a registered trademark of the National Paint and Coatings Association.

ABBREVIATIONS	ACGIH.....	American Conference of Governmental Industrial Hygienists
	OSHA.....	Occupational Safety and Health Administration
	TLV.....	Threshold Limit Value
	PEL.....	Permissible Exposure Limit
	TWA.....	Time Weighted Average
	STEL.....	Short-Term Exposure Limit
	BAC.....	Butyl acetate
	_____	Bar denotes a revision from previous MSDS in this area

The information contained herein relates only to the specific material identified. Vermillion's Environmental Products and Applications, Inc. believes that such information is accurate and reliable as of the date of this material safety data sheet, but no representation, guarantee or warranty, expressed or implied, is made as to the accuracy, reliability, or completeness of the information. Vermillion's Environmental Products and Applications, Inc. urges persons receiving this information to make their own determination as to the information's suitability and completeness for their particular application.



TOXICITY TESTING • OCEANOGRAPHIC RESEARCH

April 02, 2001

Attn: Client Services
West Coast Analytical
9840 Alburtis Avenue
Santa Fe Springs, CA 90670

Attn: Client Services:

We are pleased to present the enclosed acute bioassay report. The test was conducted under the guidelines prescribed in "St Acute Bioassay Procedures for Hazardous Waste Samples" California Department of Fish and Game, 1988. The results were as follows:


CLIENT:	West Coast Analytical
SAMPLE I.D.:	Envirotac 2, 51948
DATE RECEIVED:	03/27/01
ABC LAB. NO.:	WCA0301.557

DOHS (TITLE 22) HAZARDOUS WASTE BIOASSAY USING FATHEAD MINNOW

96 HOUR LC50 = >750 mg/l

STATUS = Pass

Respectfully yours,


for Thomas (Tim) Mikel
Laboratory Director



TRANSWEST
GEOCHEM

September 27, 2001

John Vermillion
Environmental Products & Applications
73-710 Fred Waring Dr., Suite 220
Palm Desert, CA 92260

RE: Maricopa County
Work Order No. 0109122

Dear John:

Transwest Geochem, Inc. received 3 samples on 9/19/2001 3:10:00 PM for the analyses presented in the following report.

The Case Narrative of this report addresses any Quality Control and/or Quality Assurance issues associated with this Work Order.

If you have any questions regarding these test results, please feel free to call us at (602) 437-0330.

Sincerely,



Beth Proffitt
Project Manager

ADHS License No. AZM133/AZ0133

TRANSWEST**GEOCHEM**

Client: Environmental Products & Applications
Work Order: 0109122
Project Name: Maricopa County
Project Number:

Date Printed: 27-Sep-01**CASE NARRATIVE**

Transwest Geochem, Inc. uses the methods outlined in the following references:

Code of Federal Regulations, 40CFR, Part 136, Revised July 1995.

Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992 and 19th Edition, 1995.

Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Revised March 1983.

Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, Revised August 1993.

Methods for the Determination of Metals in Environmental Samples, EPA/600/R-94/111, Revised May 1994.

Hach, Water Analysis Handbook, 2nd Edition, 1992.

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition.

Metals were analyzed using multi-element ICP instrumentation. Some metals reported in the QC report may not be associated with this Work Order.

Secondary Source QC Sample (LCSV) results may not be reported for all methods and/or analysis dates.

All method blanks, laboratory spikes, and/or matrix spikes met quality control objectives for the parameters associated with this Work Order.

Data qualifiers ("flags") contained within this analytical report have been issued to explain a quality control deficiency, and do not affect the quality (validity) of the data unless noted otherwise in the case narrative.



Date Printed 26-Sep-01

License No. AZM133/AZ0133

CLIENT: Environmental Products & Applications
Project Name: Maricopa County
Project Number:
Work Order: 0109122
Date Received: 19-Sep-01

Work Order Sample Summary

Client Sample ID	Lab Sample ID	Test Code	Collection Date
Native	0109122-01A	EPA405.1	9/18/2001 2:00:00 PM
	0109122-01B	EPA350.1	9/18/2001 2:00:00 PM
		EPA353.2	9/18/2001 2:00:00 PM
		EPA365.2	9/18/2001 2:00:00 PM
		Hach8000	9/18/2001 2:00:00 PM
	0109122-01C	EPA200.7	9/18/2001 2:00:00 PM
		EPA245.1	9/18/2001 2:00:00 PM
	0109122-01D	EPA420.1	9/18/2001 2:00:00 PM
	0109122-01E	EPA150.1	9/18/2001 2:00:00 PM
		EPA325.2	9/18/2001 2:00:00 PM
1:2		EPA340.2	9/18/2001 2:00:00 PM
	0109122-01F	SM4500-CN CE	9/18/2001 2:00:00 PM
	0109122-03A	EPA405.1	9/18/2001 2:00:00 PM
	0109122-03B	EPA350.1	9/18/2001 2:00:00 PM
		EPA353.2	9/18/2001 2:00:00 PM
		EPA365.2	9/18/2001 2:00:00 PM
		Hach8000	9/18/2001 2:00:00 PM
	0109122-03C	EPA200.7	9/18/2001 2:00:00 PM
		EPA245.1	9/18/2001 2:00:00 PM
	0109122-03D	EPA420.1	9/18/2001 2:00:00 PM
	0109122-03E	EPA150.1	9/18/2001 2:00:00 PM
		EPA325.2	9/18/2001 2:00:00 PM
		EPA340.2	9/18/2001 2:00:00 PM
	0109122-03F	SM4500-CN CE	9/18/2001 2:00:00 PM



Date Printed 26-Sep-01

License No. AZM133/AZ0133

CLIENT: Environmental Products & Applications**Project Name:** Maricopa County**Project Number:****Work Order:** 0109122**Date Received:** 19-Sep-01

Definitions

Analytical Spike (AS)	The AS is a known amount of a target analyte added to a sample after it has been distilled, digested, or extracted and is ready for analysis. The AS is generally performed if the MS has failed. It is used to indicate interference that arises from sample distillation, digestion, or extraction as opposed to interference that is innate to the matrix.
Continuing Curve Verification (CCV)	The CCV is also referred to as a curve check. This is a standard analyzed at specified intervals during an analysis. The CCV verifies the stability and accuracy of the calibration curve. There are specific CCV recovery acceptance criteria for each method.
Dilution Factor (DF)	The DF is an indication of how much a sample had to be diluted in order to quantitate it on a standard curve. The DF is indicated in the reported sample result. The sample PQL increases as the dilution increases.
Internal Standard (IS)	The IS is a compound that is similar to the organic compound of interest in terms of chemical composition but is unique in that it is rare in the environment. The same concentration of IS is added to every sample for some organic methods.
Laboratory Control Sample (LCS)	The LCS is also referred to as a blank spike. The LCS is an addition of a known amount of a target analyte (from the same source as calibration standards or spikes) to an aliquot of deionized water or other appropriate clean matrix. The LCS is processed through the entire method procedure in the same manner as samples.
Matrix Spike (MS)	The MS is a known amount of a target analyte added to a sample. The MS is processed through the entire method procedure in the same manner as samples.
Method Blank (MB)	The MB is an aliquot of deionized water or other appropriate clean matrix that is thought to be free of the analyte in question. The MB is processed through the entire extraction or analysis procedure and is used to indicate contamination in the lab.
Method Detection Limit (MDL)	The MDL is the lowest level of detection of which a method is capable.
Practical Quantitation Limit (PQL)	The PQL is the lowest value at which Transwest Geochem can detect an analyte in matrix with a high degree of confidence. The PQL will increase as the DF increases. The PQL is greater than or equal to the MDL.
Relative Percent Difference (RPD)	The RPD is a measure of precision (the ability to obtain the same result on re-analysis of the same sample). It is calculated using the result of a sample, MS, LCS, or LCSV and its associated duplicate result.
Secondary Source QC Sample (LCSV)	The LCSV is also referred to as a second source laboratory control sample. It is the same type of standard as a calibration or spiking standard but is obtained from a different source. The LCSV is an indication of the primary standard quality, method performance, and instrument performance.
Surrogate	A surrogate compound is similar to the organic compound of interest in terms of chemical composition but is unique in that it is rare in the environment. When surrogates are used, they are added to every sample, blank and standard. Surrogate recovery is used as an indication of extraction and/or analytical success.
Trip Blank (TB)	The TB is a portion of deionized water preserved in the same manner as the samples. The TB travels from the lab, to the field, and then back to the lab with the samples from the field. The TB serves as an indication of contamination introduced during sample transportation.


**TRANSWEST
GEOCHEM**

Date Printed 26-Sep-01

License No. AZM133/AZ0133

CLIENT: Environmental Products & Applications

Client Sample ID: Native

Work Order: 0109122

Collection Date: 9/18/2001 2:00:00 PM

Lab ID: 0109122-01

Matrix: WATER

Project Name: Maricopa County

Project Number:

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
pH	7.4	N/A		SL	1	EPA150.1	N/A	9/21/01 12:45	SC	PH_W-9/21/2001
Chloride	85	5.0		mg/L	1	EPA325.2	N/A	9/24/01	TL	CL_W-9/24/2001
Fluoride	0.88	0.10		mg/L	1	EPA340.2	N/A	9/26/01	SC	FL_W-9/26/2001
Nitrogen, Ammonia (As N)	<0.20	0.20		mg/L	1	EPA350.1	N/A	9/26/01	TL	NH4_W-9/26/2001
Nitrate-Nitrite (As N)	9.3	0.50		mg/L	1	EPA353.2	N/A	9/24/01	TL	NO3_W-9/24/2001
Phosphorus, Total (As P)	0.89	0.25		mg/L	5	EPA365.2	9/24/01	9/24/01	KMB	P-TOTAL-9/24/2001
Biochemical Oxygen Demand	2.4	2.0		mg/L	1	EPA405.1	N/A	9/20/01 13:00	KMB	BOD_MKL-9/20/2001
Phenolics, Total Recoverable	<0.0050	0.0050		mg/L	1	EPA420.1	9/25/01	9/25/01	KMB	420.1-9/25/2001
Chemical Oxygen Demand	15	10		mg/L	1	Hach8000	N/A	9/24/01	KMB	COD_HACH-9/24/2001
Aluminum	75	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Antimony	<0.10	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Beryllium	<0.05	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Cadmium	<0.02	0.02		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Copper	0.12	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Iron	68	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Lead	<0.10	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Magnesium	51	1.0		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Manganese	2.3	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Nickel	0.12	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Selenium	<0.10	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Silver	<0.05	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Zinc	0.26	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Mercury	<0.0006	0.0006		mg/L	3	EPA245.1	9/24/01	9/24/01	MM	4533


**TRANSWEST
GEOCHEM**

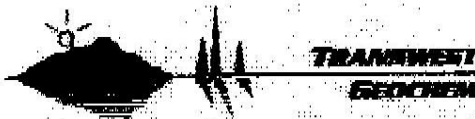
Date Printed 26-Sep-01

License No. AZM133/AZ0133

CLIENT: Environmental Products & Applications
Work Order: 0109122
Lab ID: 0109122-03
Project Name: Maricopa County
Project Number:

Client Sample ID: 1:2
Collection Date: 9/18/2001 2:00:00 PM
Matrix: WATER

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
pH	7.0	N/A		S.U.	1	EPA150.1	N/A	9/21/01 12:45	SC	PH_W-9/21/2001
Chloride	92	5.0		mg/L	1	EPA325.2	N/A	9/24/01	TL	CL_W-9/24/2001
Fluoride	0.82	0.10		mg/L	1	EPA340.2	N/A	9/25/01	SC	FL_W-9/25/2001
Nitrogen, Ammonia (As N)	0.70	0.20		mg/L	1	EPA350.1	N/A	9/25/01	TL	NH4_W-9/25/2001
Nitrate-Nitrite (As N)	9.2	0.50		mg/L	1	EPA353.2	N/A	9/24/01	TL	NO3_W-9/24/2001
Phosphorus, Total (As P)	0.41	0.050		mg/L	1	EPA365.2	9/24/01	9/24/01	KMB	P-TOTAL-9/24/2001
Biochemical Oxygen Demand	2.8	2.0		mg/L	1	EPA405.1	N/A	9/20/01 13:00	KMB	BOD_MKL-9/20/2001
Phenolics, Total Recoverable	<0.0050	0.0050		mg/L	1	EPA420.1	9/25/01	9/25/01	KMB	420.1-9/25/2001
Chemical Oxygen Demand	24	10		mg/L	1	Hach8000	N/A	9/21/01	KMB	COD_HACH-9/21/2001
Aluminum	86	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Antimony	<0.10	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Beryllium	<0.05	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Cadmium	<0.02	0.02		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Copper	0.14	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Iron	83	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Lead	<0.10	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Magnesium	62	1.0		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Manganese	2.6	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Nickel	0.14	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Selenium	<0.10	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Silver	<0.05	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Zinc	0.31	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Mercury	<0.0006	0.0006		mg/L	3	EPA245.1	9/24/01	9/24/01	MM	4533



Date: 26-Sep-01

License No. AZM133/AZ0133

CLIENT: Environmental Products & Applications

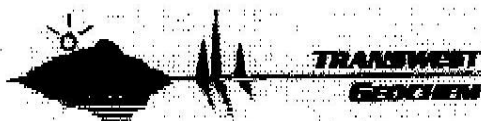
Work Order: 0109122

Project: Maricopa County

QC SUMMARY REPORT

Method Blank

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
Chloride	<5.0	5.0		mg/L	1	EPA325.2	N/A	9/24/01	TL	CL_W-9/24/2001
Fluoride	<0.10	0.10		mg/L	1	EPA340.2	N/A	9/25/01	SC	FL_W-9/25/2001
Nitrogen, Ammonia (As N)	<0.20	0.20		mg/L	1	EPA350.1	N/A	9/25/01	TL	NH4_W-9/26/2001
Nitrate (As N)	<0.50	0.50		mg/L	1	EPA353.2	N/A	9/24/01	TL	NO3_W-9/24/2001
Nitrate-Nitrite (As N)	<0.50	0.50		mg/L	1	EPA353.2	N/A	9/24/01	TL	NO3_W-9/24/2001
Phosphorus, Total (As P)	<0.050	0.050		mg/L	1	EPA365.2	9/24/01	9/24/01	KMB	P-TOTAL-9/24/2001
Biochemical Oxygen Demand	<2.0	2.0		mg/L	1	EPA405.1	N/A	9/20/01 13:00	KMB	BOD_MKL-9/20/2001
Phenolics, Total Recoverable	<0.0050	0.0050		mg/L	1	EPA420.1	9/25/01	9/25/01	KMB	420.1-9/25/2001
Chemical Oxygen Demand	<10	10		mg/L	1	Hach8000	N/A	9/21/01	KMB	COO_HACH-9/21/2001
Aluminum	<0.10	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Antimony	<0.10	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Beryllium	<0.05	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Cadmium	<0.02	0.02		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Copper	<0.05	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Iron	<0.10	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Lead	<0.10	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Magnesium	<1.0	1.0		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Manganese	<0.05	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Nickel	<0.05	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Selenium	<0.10	0.10		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Silver	<0.05	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Zinc	<0.05	0.05		mg/L	1	EPA200.7	9/24/01	9/25/01	AD	4532B
Mercury	<0.0002	0.0002		mg/L	1	EPA245.1	9/24/01	9/24/01	MM	4533



Date: 26-Sep-01

License No. AZM133/AZ0133

CLIENT: Environmental Products & Applications
 Work Order: 0109122
 Project: Maricopa County

QC SUMMARY REPORT

Sample Duplicate

Analyte	Result	PQL	Units	RPD Ref Val	% RPD	RPD Limit	Test Code	Date Prepared	Date Analyzed	Analyst	Qual
Sample ID: 0109139-02BD		Batch ID: PH_W-9/21/2001									
Client ID:											
pH	7.3	N/A	S.U.	7.254	0%	20	EPA150.1	N/A	9/21/01 12:45	SC	
Sample ID: 0109148-05AD		Batch ID: CL_W-9/24/2001									
Client ID:											
Chloride	<5.0	5.0	mg/L	<5.0	0%	20	EPA325.2	N/A	9/24/01	TL	
Sample ID: 0109122-03ED		Batch ID: FL_W-9/26/2001									
Client ID: 1:2											
Fluoride	0.82	0.10	mg/L	0.82	0%	20	EPA340.2	N/A	9/26/01	SC	
Sample ID: 0109122-03BD		Batch ID: NH4_W-9/26/2001									
Client ID: 1:2											
Nitrogen, Ammonia (As N)	0.68	0.20	mg/L	0.6986	2%	20	EPA350.1	N/A	9/26/01	TL	
Sample ID: 0109122-03BD		Batch ID: NO3_W-9/24/2001									
Client ID: 1:2											
Nitrate-Nitrite (As N)	9.2	0.50	mg/L	9.230	1%	20	EPA353.2	N/A	9/24/01	TL	
Sample ID: 0109122-01BD		Batch ID: P-TOTAL-9/24/2001									
Client ID: Native											
Phosphorus, Total (As P)	0.91	0.25	mg/L	0.8920	2%	20	EPA365.2	9/24/01	9/24/01	KMB	
Sample ID: 9999138-01AD		Batch ID: COD_HACH-9/21/2001									
Client ID:											
Chemical Oxygen Demand	900	100	mg/L	920	2%	20	Hach8000	N/A	9/21/01	KMB	



Date: 26-Sep-01

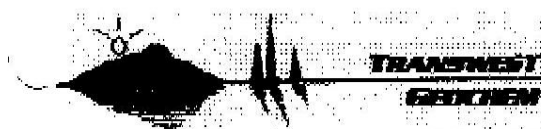
License No. AZM133/AZ0133

CLIENT: Environmental Products & Applications
 Work Order: 0109122
 Project: Maricopa County

QC SUMMARY REPORT

Sample Matrix Spike

Analyte	Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD Ref Val	% RPD	RPD Limit	Qual
Sample ID: 0109148-05AS	Batch ID: CL_W-9/24/2001			Test Code: EPA323.2			Date Analyzed: 9/24/01				
Client ID:				Units: mg/L			Date Prepared: N/A				
Chloride	98.68	5.0	100.0	<5.0	99%	90	110				
Sample ID: 0109122-03ES	Batch ID: FL_W-9/26/2001			Test Code: EPA340.2			Date Analyzed: 9/26/01				
Client ID: 1:2				Units: mg/L			Date Prepared: N/A				
Fluoride	0.82	0.10	0.50	0.40	104%	80	120				
Sample ID: 0109122-03BS	Batch ID: NH4_W-9/26/2001			Test Code: EPA350.1			Date Analyzed: 9/26/01				
Client ID: 1:2				Units: mg/L			Date Prepared: N/A				
Nitrogen, Ammonia (As N)	2.876	0.20	2.500	0.3233	102%	90	110				
Sample ID: 0109122-03BS	Batch ID: NO3_W-9/24/2001			Test Code: EPA353.2			Date Analyzed: 9/24/01				
Client ID: 1:2				Units: mg/L			Date Prepared: N/A				
Nitrate-Nitrite (As N)	9.764	0.50	5.000	4.803	99%	90	110				
Sample ID: 0109122-01BS	Batch ID: P-TOTAL-9/24/2001			Test Code: EPA365.2			Date Analyzed: 9/24/01				
Client ID: Native				Units: mg/L			Date Prepared: 9/24/01				
Phosphorus, Total (As P)	25.35	2.5	25.00	<2.5	101%	80	120				
Sample ID: 0109122-03DS	Batch ID: 420.1-9/25/2001			Test Code: EPA420.1			Date Analyzed: 9/25/01				
Client ID: 1:2				Units: mg/L			Date Prepared: 9/25/01				
Phenolics, Total Recoverable	0.09430	0.0050	0.1000	<0.0050	94%	80	120				
Sample ID: 9999138-01AS	Batch ID: COD_HACH-9/21/2001			Test Code: Hach8000			Date Analyzed: 9/21/01				
Client ID:				Units: mg/L			Date Prepared: N/A				
Chemical Oxygen Demand	2900	200	2000	780	106%	80	120				
Sample ID: 0109137-01ASD	Batch ID: 4532B			Test Code: EPA200.7			Date Analyzed: 9/25/01				
Client ID:				Units: mg/L			Date Prepared: 9/24/01				
Aluminum	1.115	0.10	1.000	0.1038	101%	70	130	1.115	0%	20	
Antimony	1.030	0.10	1.000	<0.10	103%	70	130	1.032	0%	20	
Beryllium	1.044	0.05	1.000	<0.05	104%	70	130	1.047	0%	20	
Cadmium	0.9694	0.02	1.000	<0.02	97%	70	130	0.9731	0%	20	
Copper	1.093	0.05	1.000	0.09480	100%	70	130	1.100	1%	20	
Iron	1.559	0.10	1.000	0.5944	98%	70	130	1.572	1%	20	
Lead	1.027	0.10	1.000	<0.10	103%	70	130	1.033	1%	20	
Magnesium	76.31	1.0	51.00	25.16	100%	70	130	77.17	1%	20	
Manganese	1.131	0.05	1.000	0.1597	97%	70	130	1.138	1%	20	
Nickel	1.036	0.05	1.000	<0.05	104%	70	130	1.038	0%	20	
Selenium	1.071	0.10	1.000	<0.10	107%	70	130	1.075	0%	20	
Silver	0.4558	0.05	0.5000	<0.05	91%	70	130	0.4581	1%	20	
Zinc	1.028	0.05	1.000	<0.05	103%	70	130	1.028	0%	20	



Date: 26-Sep-01

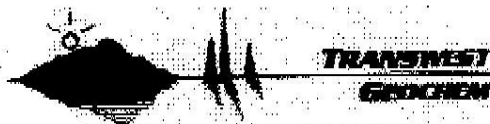
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CLIENT: Environmental Products & Applications
 Work Order: 0109122
 Project: Maricopa County

QC SUMMARY REPORT

Sample Matrix Spike

Analyte	Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD Ref Val	% RPD	RPD Limit	Qual
Sample ID: 0109137-01AS		Batch ID: 4532B		Test Code: EPA200.7		Date Analyzed: 9/25/01					
Client ID:				Units: mg/L		Date Prepared: 9/24/01					
Aluminum	1.115	0.10	1.000	0.1038	101%	70	130				
Antimony	1.032	0.10	1.000	<0.10	103%	70	130				
Beryllium	1.047	0.05	1.000	<0.05	105%	70	130				
Cadmium	0.9731	0.02	1.000	<0.02	97%	70	130				
Copper	1.100	0.05	1.000	0.09480	101%	70	130				
Iron	1.572	0.10	1.000	0.5944	98%	70	130				
Lead	1.033	0.10	1.000	<0.10	103%	70	130				
Magnesium	77.17	1.0	51.00	25.16	102%	70	130				
Manganese	1.138	0.05	1.000	0.1597	98%	70	130				
Nickel	1.038	0.05	1.000	<0.05	104%	70	130				
Selenium	1.075	0.10	1.000	<0.10	108%	70	130				
Silver	0.4581	0.05	0.5000	<0.05	92%	70	130				
Zinc	1.028	0.05	1.000	<0.05	103%	70	130				
Sample ID: 0109122-01CSD		Batch ID: 4533		Test Code: EPA245.1		Date Analyzed: 9/24/01					
Client ID: Native				Units: mg/L		Date Prepared: 9/24/01					
Mercury	0.001054	0.0006	0.001000	<0.0006	105%	70	130	0.001096	4%	20	
Sample ID: 0109122-01CS		Batch ID: 4533		Test Code: EPA245.1		Date Analyzed: 9/24/01					
Client ID: Native				Units: mg/L		Date Prepared: 9/24/01					
Mercury	0.001096	0.0006	0.001000	<0.0006	110%	70	130				



Date: 26-Sep-01

License No. AZM133/AZ0133

CLIENT: Environmental Products & Applications
Work Order: 0109122
Project: Maricopa County

QC SUMMARY REPORT

Blank Spike (primary source)

Analyte	Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD Ref Val	% RPD	RPD Limit	Qual
Sample ID: LCS	Batch ID: CL_W-9/24/2001			Test Code: EPA325.2				Date Analyzed: 9/24/01			
				Units: mg/L				Date Prepared: N/A			
Chloride	100.9	5.0	100.0	<5.0	101%	90	110				
Sample ID: LCS	Batch ID: FL_W-9/26/2001			Test Code: EPA340.2				Date Analyzed: 9/26/01			
				Units: mg/L				Date Prepared: N/A			
Fluoride	0.50	0.10	0.50	<0.10	100%	85	115				
Sample ID: LCS	Batch ID: NH4_W-9/26/2001			Test Code: EPA350.1				Date Analyzed: 9/26/01			
				Units: mg/L				Date Prepared: N/A			
Nitrogen, Ammonia (As N)	2.489	0.20	2.500	<0.20	99%	90	110				
Sample ID: LCS	Batch ID: NO3_W-9/24/2001			Test Code: EPA353.2				Date Analyzed: 9/24/01			
				Units: mg/L				Date Prepared: N/A			
Nitrate-Nitrite (As N)	5.172	0.50	5.000	<0.50	103%	90	110				
Sample ID: LCS	Batch ID: P-TOTAL-9/24/2001			Test Code: EPA365.2				Date Analyzed: 9/24/01			
				Units: mg/L				Date Prepared: 9/24/01			
Phosphorus, Total (As P)	0.4913	0.050	0.5000	<0.050	98%	85	115				
Sample ID: LCSD	Batch ID: BOD_MKL-9/20/2001			Test Code: EPA405.1				Date Analyzed: 9/20/01 13:00			
				Units: mg/L				Date Prepared: N/A			
Biochemical Oxygen Demand	218.0	2.0	190.0	<2.0	110%	85	115	201.5	8%	20	
Sample ID: LCS	Batch ID: BOD_MKL-9/20/2001			Test Code: EPA405.1				Date Analyzed: 9/20/01 13:00			
				Units: mg/L				Date Prepared: N/A			
Biochemical Oxygen Demand	201.5	2.0	190.0	<2.0	102%	85	115				
Sample ID: LCSD	Batch ID: 420.1-9/25/2001			Test Code: EPA420.1				Date Analyzed: 9/25/01			
				Units: mg/L				Date Prepared: 9/25/01			
Phenolics, Total Recoverable	0.09700	0.0050	0.1000	<0.0050	97%	85	115	0.09930	2%	20	
Sample ID: LCS	Batch ID: 420.1-9/25/2001			Test Code: EPA420.1				Date Analyzed: 9/25/01			
				Units: mg/L				Date Prepared: 9/25/01			
Phenolics, Total Recoverable	0.09930	0.0050	0.1000	<0.0050	99%	85	115				
Sample ID: LCS	Batch ID: COD_HACH-9/21/2001			Test Code: Hach8000				Date Analyzed: 9/21/01			
				Units: mg/L				Date Prepared: N/A			
Chemical Oxygen Demand	101	10	100	<10	101%	85	115				



Date: 26-Sep-01

License No. AZM133/AZ0133

CLIENT: Environmental Products & Applications

Work Order: 0109122

Project: Maricopa County

QC SUMMARY REPORT

Blank Spike (primary source)

Analyte	Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD Ref Val	% RPD	RPD Limit	Qual
Sample ID: LCS-D-4532		Batch ID: 4532B		Test Code: EPA200.7		Date Analyzed: 9/25/01					
				Units: mg/L		Date Prepared: 9/24/01					
Aluminum	1.010	0.10	1.000	<0.10	101%	85	115	1.014	0%	20	
Antimony	0.9645	0.10	1.000	<0.10	96%	85	115	0.9709	1%	20	
Beryllium	1.009	0.05	1.000	<0.05	101%	85	115	1.018	1%	20	
Cadmium	0.9334	0.02	1.000	<0.02	93%	85	115	0.9395	1%	20	
Copper	0.9518	0.05	1.000	<0.05	95%	85	115	0.9566	1%	20	
Iron	0.9674	0.10	1.000	<0.10	97%	85	115	0.9799	1%	20	
Lead	0.9787	0.10	1.000	<0.10	98%	85	115	0.9815	0%	20	
Magnesium	49.72	1.0	51.00	<1.0	97%	85	115	49.87	0%	20	
Manganese	0.9437	0.05	1.000	<0.05	94%	85	115	0.9511	1%	20	
Nickel	0.9552	0.05	1.000	<0.05	96%	85	115	0.9605	1%	20	
Selenium	1.013	0.10	1.000	<0.10	101%	85	115	1.012	0%	20	
Silver	0.5226	0.05	0.5000	<0.05	105%	85	115	0.5084	3%	20	
Zinc	0.9603	0.05	1.000	<0.05	96%	85	115	0.9650	0%	20	

Sample ID: LCS-4532		Batch ID: 4532B		Test Code: EPA200.7		Date Analyzed: 9/25/01					
				Units: mg/L		Date Prepared: 9/24/01					
Aluminum	1.014	0.10	1.000	<0.10	101%	85	115				
Antimony	0.9709	0.10	1.000	<0.10	97%	85	115				
Beryllium	1.018	0.05	1.000	<0.05	102%	85	115				
Cadmium	0.9395	0.02	1.000	<0.02	94%	85	115				
Copper	0.9566	0.05	1.000	<0.05	96%	85	115				
Iron	0.9799	0.10	1.000	<0.10	98%	85	115				
Lead	0.9815	0.10	1.000	<0.10	98%	85	115				
Magnesium	49.87	1.0	51.00	<1.0	98%	85	115				
Manganese	0.9511	0.05	1.000	<0.05	95%	85	115				
Nickel	0.9605	0.05	1.000	<0.05	96%	85	115				
Selenium	1.012	0.10	1.000	<0.10	101%	85	115				
Silver	0.5084	0.05	0.5000	<0.05	102%	85	115				
Zinc	0.9650	0.05	1.000	<0.05	97%	85	115				

Sample ID: LCS-D-4533		Batch ID: 4533		Test Code: EPA245.1		Date Analyzed: 9/24/01					
				Units: mg/L		Date Prepared: 9/24/01					
Mercury	0.0009964	0.0002	0.001000	<0.0002	100%	85	115	0.001020	2%	20	
Sample ID: LCS-4533		Batch ID: 4533		Test Code: EPA245.1		Date Analyzed: 9/24/01					
				Units: mg/L		Date Prepared: 9/24/01					
Mercury	0.001020	0.0002	0.001000	<0.0002	102%	85	115				



Date: 26-Sep-01

License No. AZM133/AZ0133

CLIENT: Environmental Products & Applications
 Work Order: 0109122
 Project: Maricopa County

QC SUMMARY REPORT

Secondary Source Blank Spike

Analyte	Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD Ref Val	% RPD	RPD Limit	Qual
Sample ID: LCSV	Batch ID: CL_W-9/24/2001			Test Code: EPA325.2				Date Analyzed: 9/24/01			
				Units: mg/L				Date Prepared: N/A			
Chloride	99.37	5.0	100.0	<5.0	99%	90	110				
Sample ID: LCSV	Batch ID: FL_W-9/26/2001			Test Code: EPA340.2				Date Analyzed: 9/26/01			
				Units: mg/L				Date Prepared: N/A			
Fluoride	0.78	0.10	0.75	<0.10	104%	85	115				
Sample ID: LCSV	Batch ID: NH4_W-9/26/2001			Test Code: EPA350.1				Date Analyzed: 9/26/01			
				Units: mg/L				Date Prepared: N/A			
Nitrogen, Ammonia (As N)	2.514	0.20	2.500	<0.20	101%	90	110				
Sample ID: LCSV	Batch ID: NO3_W-9/24/2001			Test Code: EPA353.2				Date Analyzed: 9/24/01			
				Units: mg/L				Date Prepared: N/A			
Nitrate-Nitrite (As N)	5.033	0.50	5.000	<0.50	101%	90	110				
Sample ID: LCSV	Batch ID: P-TOTAL-9/24/2001			Test Code: EPA363.2				Date Analyzed: 9/24/01			
				Units: mg/L				Date Prepared: 9/24/01			
Phosphorus, Total (As P)	0.4949	0.050	0.5000	<0.050	99%	85	115				
Sample ID: LCSV	Batch ID: COD HACH-9/21/2001			Test Code: Hach8000				Date Analyzed: 9/21/01			
				Units: mg/L				Date Prepared: N/A			
Chemical Oxygen Demand	107	10	100	<10	107%	85	115				



TRANSWEST
GEOCHEM

September 27, 2001

John Vermillion
Environmental Products & Applications
73-710 Fred Waring Dr., Suite 220
Palm Desert, CA 92260

Re: Maricopa County
Work Order No.: 0109122

Dear John:

Attached is the original Report of Analysis from Precision Analytical Laboratories, Inc, for the samples received on 9/19/2001 3:10:00 PM. The following analysis was performed:

Method M4500-CN CE - Cyanide, Total

If you have any questions regarding the results, please call me. We appreciate your business and thank you for choosing Transwest Geochem.

Sincerely,



Beth Proffitt
Project Manager

ADHS License No. AZM133/AZ0133



CHAIN-OF-CUSTODY

Page 1 of 1

0-109-559

Proffitt

725 E. Atlanta Avenue

Jrte 2

Phoenix, AZ 85040-2960

TEL: (602) 437-0330

FAX: (602) 437-0660

Work Order: 0109122

Project: Maricopa County

Contractor:

Precision Analytical Laboratories, Inc.

725 West 17th St.

Tempe, AZ 85281

TEL: (480) 967-1310

FAX: (480) 967-1019

21-Sep-01

Client Sample ID	TGI ID	Matrix	Collection Date	Containers	CN SUB	Requested Tests			
NATIVE	01F	Water	9/18/2001 2:00:00 PM	1	1				
1:2	03F	Water	9/18/2001 2:00:00 PM	1	1				

Comments: After analysis, the samples do not need to be returned and can be disposed per your standard laboratory practices. Please provide a QC report, including Method Blank data.

RUSH 72 hr TAT ?

Sample Receipt			
Temperature:	3.9	Ambient / Cold	Ice:
Received Intact:	Yes	Absent / Present	
Custody Seals:	No	Wet / Blue	
Total No. of Containers:	2	3.9 °C.	

Acquired by: Billy Wathall 9/21/01

Date/Time

1440

Received by:

Ingherson

Date/Time

9/21/01 1440

Acquired by:

Received by:



Precision Analytical Laboratories, Inc.

A Division of Aerotech Laboratories, Inc.

September 24, 2001

Beth Proffitt
Transwest Geochem, Inc.
3725 E. Atlanta Avenue, Suite 2
Phoenix, AZ 85040
TEL: (602) 437-0330
FAX (602) 437-0660

RE: Maricopa County/0109122

Order No.: 0109559

Dear Beth Proffitt:

Precision Analytical Laboratories, Inc. received 2 samples on 9/21/2001 for the analyses presented in the following report.

This report includes the following information:

- Case Narrative.
- Analytical Report: includes test results, report limit (Limit), any applicable data qualifier (Qual), units, dilution factor (DF), and date analyzed.
- QC Summary Report.

This communication is intended only for the individual or entity to whom it is directed. It may contain information that is privileged, confidential, or otherwise exempt from disclosure under applicable law. Dissemination, distribution, or copying of this communication by anyone other than the intended recipient, or a duly designated employee or agent of such recipient, is prohibited. If you have received this communication in error, please notify us immediately and destroy this message and all attachments thereto. If you have any questions regarding these test results, please do not hesitate to call.

Sincerely,

Carlene McCutcheon
Project Manager

CC:



Precision Analytical Laboratories, Inc.

A Division of Aerotech Laboratories, Inc.

Date: 24-Sep-01

CLIENT: Transwest Geotech, Inc.
Project: Maricopa County/0109122
Lab Order: 0109559

CASE NARRATIVE

Data Qualifiers:

Listed below are data qualifiers which may be used in your analytical report to explain any analytical or quality control issues. If one or more of the following data qualifiers is associated with your analytical or quality control data it will be noted in your report under the column header "QUAL". Any quality control deficiencies that cannot be adequately described by these qualifiers will be addressed in the analytical comments section of this case narrative.

- B1 Target analyte detected in method blank at or above the method reporting limit.
- D1 Sample required dilution due to matrix interference.
- D2 Sample required dilution due to high concentration of target analyte.
- D3 Sample dilution required due to insufficient sample.
- D4 Minimum reporting level (MRL) adjusted to reflect sample amount received and analyzed.
- E1 Concentration estimated. Analyte exceeded calibration range. Reanalysis not possible due to insufficient sample.
- E2 Concentration estimated. Analyte exceeded calibration range. Reanalysis not performed due to sample matrix.
- E3 Concentration estimated. Analyte exceeded calibration range. Reanalysis not performed due to holding time requirements.
- E4 Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL).
- E6 Concentration estimated. Internal standard recoveries did not meet method acceptance criteria.
- E7 Concentration estimated. Internal standard recoveries did not meet laboratory acceptance criteria.
- H1 Sample analysis performed past holding time. See case narrative.
- H2 Initial analysis within holding time. Reanalysis for the required dilution was past holding time.
- H3 Sample was received and analyzed past holding time.
- H4 Sample was extracted past required extraction holding time, but analyzed within analysis holding time. See case narrative.
- K1 The sample dilutions set-up for the BOD analysis did not meet the oxygen depletion criteria of at least 2 mg/L. The reported result is an estimated value.
- K2 The sample dilutions set up for the BOD analysis failed to meet the criteria of a residual dissolved oxygen of at least 1 mg/L. The reported result is estimated.
- L1 The associated blank spike recovery was above laboratory acceptance limits. See case narrative.
- L2 The associated blank spike recovery was below laboratory acceptance limits. See



Precision Analytical Laboratories, Inc.

A Division of Aerotech Laboratories, Inc.

CLIENT: Transwest Geochem, Inc.
Project: Maricopa County/0109122
Lab Order: 0109559

CASE NARRATIVE

case narrative.

- M1 Matrix spike recovery was high, the method control sample recovery was acceptable.
- M2 Matrix spike recovery was low, the method control sample recovery was acceptable.
- M3 The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable.
- M4 The analysis of the spiked sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable.
- M5 Analyte concentration was determined by the method of standard addition (MSA).
- N1 See case narrative.
- Q1 Sample integrity was not maintained. See case narrative.
- Q2 Sample received with head space.
- Q3 Sample received with improper chemical preservation.
- Q5 Sample received without chemical preservation, but preserved by the laboratory.
- Q6 Sample was received above recommended temperature.
- Q7 Sample inadequately dechlorinated.
- Q8 Insufficient sample received to meet method QC requirements. QC requirements satisfy ADEQ policies 0154 and 0155.
- Q10 Sample received in inappropriate sample container.
- Q11 Sample is heterogeneous. Sample homogeneity could not be readily achieved using routine laboratory practices.
- R2 RPD exceeded the laboratory control limit. See case narrative.
- R3 Sample RPD between the primary and confirmatory analysis exceeded 40%. Per EPA Method 8000B, the higher value was reported.
- R4 RPD exceeded the method control limit. Recovery met acceptance criteria.
- R5 RPD exceeded the laboratory control limit. Recovery met acceptance criteria.
- S2 Surrogate recovery was above laboratory and method acceptance limits.
- S4 Surrogate recovery was above laboratory and method acceptance limits. No target analytes were detected in the sample.
- S6 Surrogate recovery was below laboratory and method acceptance limits. Reextraction and/or reanalysis confirms low recovery caused by matrix effect.
- S7 Surrogate recovery was below laboratory and method acceptance limits. Unable to confirm matrix effect.
- S9 The analysis of the sample required a dilution such that the surrogate concentration was diluted below the laboratory acceptance criteria. The method control sample recovery was acceptable.
- S10 Surrogate recovery was above laboratory and method acceptance limits. See case narrative (N1).
- T2 Cited ADHS licensed method does not contain this analyte as part of method



Precision Analytical Laboratories, Inc.

A Division of Aerotech Laboratories, Inc.

CLIENT: Transwest Geoschem, Inc.

Project: Maricopa County/0109122

Lab Order: 0109559

CASE NARRATIVE

compound list.

- T4 Tentatively identified compound. Concentration is estimated and based on the closest internal standard.
- V1 CCV recovery was above method acceptance limits. This target analyte was not detected in the sample.
- V2 CCV recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample.
- V5 CCV recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA Method 8000B.

Samples were analyzed using methods outlined in references such as:

Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992, and 19th Edition, 1995.

Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Revised March 1983.

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition.

40 CFR, Part 136, Revised 1995. Appendix A to Part 136 - Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater.

NIOSH Manual of Analytical Methods, Fourth Edition, 1994.

Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, 1999.

Precision Analytical Laboratories, Inc (PAL) holds the following certifications:

Arizona (certification no. AZ0610) and California (I-2410).

PAL - Tucson laboratory, Arizona certification number: AZ0609.

PAL participates in the AIHA Proficiency Analytical Testing (PAT) program for metals, solvents, and formaldehyde.

Analytical Comments:

All method blanks and laboratory control spikes met EPA method and/or laboratory quality control objectives for the analyses included in this report.



Precision Analytical Laboratories, Inc.

A Division of Aerotech Laboratories, Inc.

Date: 24-Sep-01

CLIENT:	Transwest Geochem, Inc.	Client Sample ID:	Native
Lab Order:	0109559	Tag Number:	01F
Project:	Maricopa County/0109122	Collection Date:	9/18/2001 2:00:00 PM
Lab ID:	0109559-01A	Matrix:	WATER

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
CYANIDE, TOTAL		M4500-CN CE				Analyst: LD
Cyanide, Total	< 0.020	0.020		mg/L	1	9/24/2001 9:30:00 AM

Qualifiers: ND - Not Detected at the Reporting Limit
1 - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Block
* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range



Precision Analytical Laboratories, Inc.

A Division of Aerotech Laboratories, Inc.

Date: 24-Sep-01

CLIENT:	Transwest Geochem, Inc.	Client Sample ID:	1-2
Lab Order:	0109559	Tag Number:	Q3F
Project:	Maricopa County/0109122	Collection Date:	9/18/2001 2:00:00 PM
Lab ID:	0109559-02A	Matrix:	WATER

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
CYANIDE, TOTAL		M4500-CN CE				Analyst: LD
Cyanide, Total	< 0.020	0.020		mg/L	1	9/24/2001 9:30:00 AM

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level

- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range



Precision Analytical Laboratories, Inc.

Date: 24-Sep-01

CLIENT: Transwest Geotech, Inc.
Work Orders: 0100559
Project: Maricopa County/0109122

QC SUMMARY REPORT

Method Blank

Sample ID: MB-R13590	Batch ID: R13590	Test Code: M4500-CN-C	Units: mg/L	Analysis Date: 9/24/2001 9:30:00 AM	Prep Date:
Client ID:	Run ID: SPEC F_010924E	SeqNo: 153062			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val %RPD RPDLimit Qual
Cyanide, Total	<0.020	0.02			

Qualifiers: N= Not Detected at the Reporting Limit
D= Analysis Detected Below quantitation Limit

S= Spike Recovery outside accepted recovery limits
R= RPD outside accepted recovery limits

B= Analyte detected in the associated Method Blank



Precision Analytical Laboratories, Inc.

Date: 24-Sep-01

CLIENT: Transwest Geophysics, Inc.
Work Order: 0109559
Project: Maricopa County 0109122

QC SUMMARY REPORT

Sample Matrix Spike

Sample ID: 0109453-01a.ms	Batch ID: R13590	Test Code: M4500-CN C	Units: mg/L	Analysis Date: 9/24/2001 9:30:00 AM	Prep Date:						
Client ID:	Run ID: SPEC 1_010924B	SeqNo: 153069									
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Cyanide, Total	0.199	0.02	0.2	0	99.5	80	120	0			

Sample ID: 0109453-01a.ms	Batch ID: R13590	Test Code: M4500-CN C	Units: mg/L	Analysis Date: 9/24/2001 9:30:00 AM	Prep Date:						
Client ID:	Run ID: SPEC 1_010924B	SeqNo: 153070									
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Cyanide, Total	0.202	0.02	0.2	0	101	80	120	0.199	1.5	10	

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits

B - Analyte detected in the associated Method Blank

2



Precision Analytical Laboratories, Inc.

Date: 24-Sep-01

CLIENT: Transwest Geochem, Inc.
Work Order: 0109559
Project: Maricopa County/0109122

QC SUMMARY REPORT

Laboratory Control Spike - generic

Sample ID: LCS-R13590	Batch ID: R13590	Test Code: M4500-CN-C	Units: mg/L	Analysis Date: 9/24/2001 9:30:00 AM	Prep Date:						
Client ID:	Run ID: SPEC 1_010924B	Seq No: 453063									
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Cyanide, Total	0.211	0.02	0.2	0	100	90	110	0			

Qualifiers: ND - Not Detected at the Reporting Limit
I - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits

B - Analyte detected in the associated Method Blank

3

Attachment 2



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8, MONTANA OFFICE
FEDERAL BUILDING, 10 W. 15th STREET, SUITE 3200
HELENA, MONTANA 59626

Ref: 8MO

January 19, 2007

Mr. Steve Ferry
Atlantic Richfield Company
317 Anaconda Road
Butte, Montana 59701

Dear Steve:

EPA, in consultation with DEQ, has reviewed and approves, with the attached comments, the *Draft Final Opportunity Ponds Remedial Design Unit (RDU) 8 Dust Management Plan*, dated November 2006. The attached comments must be incorporated into the Final Plan and submitted to the Agencies as soon as possible.

Based on recent observations of dust in January, the Agencies require Atlantic Richfield to resume surfactant applications as soon as weather permits. Areas to receive surfactant include all open tailings areas that did not receive surfactant application in 2006, and certain areas, sprayed in 2006, as determined by oversight personnel. It was also noted that cover soil areas that have not been stabilized by vegetation have significantly contributed to this winters dust problem. These areas must also be addressed through surfactant or other method (i.e., mulching). In particular, all areas that have not been permanently seeded should be addressed as soon as weather permits.

If you have any questions, please give me a call immediately.

Sincerely,

A handwritten signature in black ink, appearing to read "Charles Coleman".

Charles Coleman
Anaconda Project Manager

Enclosure



Printed on Recycled Paper

cc: Andy Lensink, ENF-L
Larry Scusa, DEQ
Mary Capdeville, NRD
Gunnar Emilsson, CDM
Ken Brockman, BOR
Becky Guay, ADL

AR: Robin Bullock, AR
Pam Sbar, DGS
Bill Duffy, DGS
✓ Tim Hilmo, PTS
Doug Graves, TREC

RECEIVED

JAN 23 2007

**Agency Review
Draft Final
Opportunity Ponds Remedial Design Unit (RDU) 8
Dust Management Plan
Dated November 2006**

Section 3.0 Site Dust Control

Comments:

This section defines the operational requirement for dust control as prevention of dust from migrating outside of the Opportunity Ponds RDU 8 site boundary. The Agencies agree that the RDU boundary is the appropriate point of compliance for the contaminant-specific performance standards identified in the Final Remedial Design Work Plan (RDWP), Section 7.2.3 Air Quality Standards and would apply to non-construction areas (i.e., open tailings areas or completed actions). However, action-specific performance standards, as identified in the RDWP, Section 7.4.1.1 Air Requirements, which require the use of Best Management Practices (BMPs) during construction and measurement, must be achieved "within the area of the RD/RA activities".

The Agencies comments on the various sections of the Dust Management Plan assume that triggers will be used to start or increase implementation of BMPs. The triggers will prompt action before dust migrates beyond the point of compliance.

It is expected that continued use of current practices and implementation of the BMPs (as modified in the comments below) will achieve the objectives. If operations must be shut down due to non-achievement of the objectives, the BMPs must be re-evaluated prior to resuming activities to determine what additional BMPs or actions are required to assure that the objectives are met when operations resume.

The triggers have been established in these comments to allow for control of dust while allowing for construction operations to proceed in a normal manner. In addition to assuring that dust does not migrate off-site, there are other considerations that may dictate the amount of dust control required. Worker safety, in terms of exposure to contaminants and silica plus the potential for accidents if the visibility of operators and/or drivers is impaired, is of paramount importance. Contamination of adjacent clean areas or completed covers by windblown impacted soils, imported materials or tailings must be prevented to protect the remedy. Standard construction practices and good housekeeping call for minimizing dust during all operations associated with a project and preventing nuisance dust.

To assure the continued use of the BMPs and practices in this plan, it must be amended to the Construction Quality Assurance Plan and will pertain to all operations on RDU 8. All of the current procedures and BMPs in the plan, including those stated in the paragraphs as well as those presented as bullet items, must be carried out.

Section 3.1.1 Haul Roads

Comments:

The objective of the BMPs for the haul roads is to minimize dust generated by the haul truck tires on the haul roads. The trigger for BMPs (water, surfactant) is at the haul road surface. If dust is observed at the tires of the haul trucks, water must be applied to the haul road surface (weather permitting) or hauling operations must be re-routed or shut down. If dust is observed 200 feet from the haul truck tires, more water trucks are required to keep up with the water.

Dust from haul operations will not be allowed to migrate across the ponds to the perimeter dikes. If this happens, dust is out of control. Haul operations will be completely shut down until it is determined what additional BMPs are required to prevent a repeat of the situation.

Current procedures described in this section, such as traffic management and speed control, are considered to be BMPs and must continue to be followed, in addition to the bullet items in the following sections.

Section 3.1.1.2 Water

Comments:

An adequate number of water trucks for the current operations is essential. As stated, it is preferable to have one water truck assigned to each haul route. Other considerations include the need for additional trucks if any of the trucks are dedicated to short term assignments such as providing water for surfactant application, maintaining magnesium chloride, hauling leachate, dust control for off-site projects, etc.

Revisions required

Second Bullet: Replace with : "Haul roads that are actively being used within the Opportunity Pond construction area will receive water on an as needed basis so that dust is not generated by the haul truck tires. Roads to receive water primarily include secondary roads, roads that have not received surfactant, and borrow area haul routes."

Third Bullet: Replace with "If BMPs currently in use fail to prevent dust from being generated by haul traffic (as demonstrated by observation of dust more than 200 feet from the haul truck tires) operations will be altered or suspended. Alterations include increasing the number of water trucks or concentrating the water trucks on dry roads or sections of roads. Haul routes may be changed to avoid dry roads until adequate water can be applied to prevent dust.

Add Fourth Bullet: "If the BMPs fail to prevent dust from the haul truck tires, hauling operations must be shut down and the BMPs re-evaluated prior to resuming haul."

Section 3.1.2 Borrow Areas

Comments:

Prevention of dust from migrating outside the of the designated borrow area boundaries is a worst case scenario. Dust must be kept to a minimum for worker safety as well as preventing contamination of Type A and Type B materials with Type D (rogue waste) and Type E (impacted soils) materials. Migration of dust outside the borrow area indicates a failure of the BMPs to control dust.

The trigger location is the immediate area of the borrow area operations. The BMPs listed in the plan and modified by these comments apply to specific operations within the borrow area and should prevent migration of dust outside of the borrow area boundaries. If dust migrates outside of the boundary, operations must be shut down and the BMPs re-evaluated prior to resumption of activities to assure that dust does not again migrate outside of the boundaries.

Section 3.1.2.1 Excavation and Loading

Comments:

Although excavation of Type A material approaches the alluvium material, to meet the soil specifications a thin layer of A material is left over the rock to prevent adding rock to the stockpile. This thin layer is often more prone to migration during traffic and wind events than other in-place materials. The BMPs will probably control this dust, but the areas should be monitored to assure that dust is controlled.

The trigger for action is located at the excavation and loading area. If operations begin to generate dust of a quantity that has the potential to migrate outside of the designated borrow area boundaries with a wind of 5 mph, activities will be suspended or moved until BMPs can mitigate generated dust. This will preclude generating a cloud of dust around the operation even though it may not be moving. It will also prevent impacted soils and rogue waste from potentially contaminating clean areas as the wind increases.

Revisions required:

First Bullet: Change "does not migrate outside of the designated borrow boundaries" to "does not expose workers to unacceptable levels of dust, does not impair visibility of operators and drivers, and does not contaminate adjacent materials."

Third Bullet: Change "does not migrate outside of the designated borrow boundaries" to "does not expose workers to unacceptable levels of dust, does not impair visibility of operators and drivers, and does not contaminate adjacent materials."

Fourth Bullet: Change "migrates outside" to "has the potential to migrate outside with a 5 mph wind"

Add Fifth Bullet: "If dust caused by excavation and loading operations migrates outside of the designated borrow boundaries, these activities will be shut down and the BMPs re-evaluated prior to resumption of activities to assure that dust does not again migrate outside of the boundaries."

Section 3.1.2.2 Borrow Areas

Comment:

As stated in the previous comment, the alluvium material left after excavation of Type A material is covered by a thin layer of unstable soil.

Revisions Required:

First Bullet: Change "does not migrate outside of the designated borrow boundaries" to "does not expose workers to unacceptable levels of dust, does not impair visibility of operators and drivers, and does not contaminate adjacent materials."

Second Bullet: Change "within 6 months following construction activity" to "within 6 months following construction activity and no later than soil freeze-up in any year. Vegetative cover from temporary seeding must be successful to the extent that migration of materials does not occur."

Add Third Bullet: "If dust caused from active or inactive borrow areas migrates outside of the designated borrow boundaries, open areas must immediately be heavily watered and stabilized with straw mulch, surfactant, or other approved method. Borrow area BMPs must be re-evaluated prior to resumption of activities to assure that dust does not again migrate outside of the boundaries."

Section 3.1.2.3 Borrow Material Stockpiles

Comment:

The trigger for BMPs is at the stockpile location. If BMPs fail to prevent migration of materials outside of the boundaries or to clean soil areas, immediate actions, including heavy water application and removal of the stockpiles, must take place as described below.

Revisions required:

First Bullet: Change "does not migrate outside of the designated borrow boundaries" to "does not expose workers to unacceptable levels of dust, does not impair visibility of operators and drivers, and does not contaminate adjacent materials. Water will be applied when dust is visibly migrating from the stockpiles during a 20 mph or less wind event."

Third Bullet: Change "does not migrate outside of the designated borrow boundaries" to "does not expose workers to unacceptable levels of dust, does not impair visibility of operators and drivers, and does not contaminate adjacent materials. Water will be applied when dust is visibly migrating from the stockpiles during a 20 mph or less wind event."

Fourth Bullet - Change "within 6 months following construction activity" to "within 6 months following construction activity and no later than soil freeze-up in any year. Vegetative cover from temporary seeding must be successful to the extent that migration of materials does not occur."

Add Fifth Bullet: "If dust from stockpiles migrates to clean soil areas or outside of the designated borrow boundaries, BMPs have failed and the stockpiles must immediately be watered heavily, kept wet and removed within one week. Stockpiling of this type of material will be suspended immediately and not be resumed until BMPs are re-evaluated to assure that dust can be controlled on future stockpiles."

Section 3.1.3 Cover Installation Operations

Comments:

This section combines cover material placement and dust control with lime treatment. These operations are vastly different. While migration of dust from lime application is inherent to that operation, migration of dust from lay down areas is not necessary and may result in contamination of adjacent covers with impacted soils prior to treatment. The specifics for dust control for each of these operations are provided in the comments on the next two sections.

Use of the site boundary as the point of compliance is discussed in the sections below.

3.1.3.1 Lay Down Areas

Comments:

The goal is to establish a surface that will stabilize the materials through the use of a vegetative cover (temporary or final seeding), application of water to form a crust, mulch, surfactant, or other approved methods to prevent migration of the cover materials.

The BMPs are intended to prevent migration of dust during and after cover installation to prevent exposure of workers to unacceptable levels of dust, to not impair visibility of operators and drivers, and to prevent contamination of adjacent materials.

Type E, F, G material and any other imported materials that have been placed shall receive special attention to assure that this material does not migrate to and contaminate adjacent covers

Revisions Required:

First Bullet: Add "Lay down operations shall be sequenced, and water trucks made available, so that most material at final grade can be accessed and watered. If watering is not possible, other BMPs may be required."

Second Bullet: Add "If limed materials cannot be seeded during the next window due to mellowing or poor seed bed due to fluff or other conditions, straw mulch, surfactant or other dust control BMPs are required."

Third Bullet: Change "within 6 months following construction activity" to "as soon as possible after placement, within 6 months following construction activity and no later than freeze-up in any year. Vegetative cover from temporary seeding must be successful to the extent that migration of materials does not occur."

Add Fourth Bullet: "Impacted soils and imported materials will be sampled to determine if lime is required within 2 months of placement so that determination can be made as to whether these areas can be seeded during the next window. Any areas that cannot be sampled within two months will receive temporary seeding."

Add Fifth Bullet: "If dust from untreated impacted soils or imported materials migrates to Type A or Type B materials, or if dust from any lay down area migrates over 1000 feet in a 20 mph wind, mulch or surfactant must be immediately applied to the surface. If dust migrates outside of the RDU 8 boundary, BMPs have failed and all operations will be shut down until it is determined how to keep dust from lay down areas from migrating."

3.1.3.2 Lime Amendment

Comments:

It is understood that lime spreading operations inherently generate dust. While the generation of dust is unavoidable, BMPs have been established to limit the extent of migration of the dust and avoid contact with people and animals. These were practiced to some extent on the Anaconda Ponds, Stucky Ridge, West Galen and the Old Works projects but have never been in writing.

The BMPs in the paragraphs and bullets in this section, as modified below, will provide the greatest confidence that windblown lime will not migrate off-site. They take into consideration wind speed and direction, proximity to houses and livestock, lime application rate, and lime properties.

Triggers for suspending lime spreading operations depend on the location of the lime spreading activity:

- o Within the cells of the Opportunity Ponds: When dust from lime application approaches the perimeter dikes, operations will be suspended. In most cases this will allow the lime dust to settle before it reaches the RDU 8 boundary.
- o In upland areas outside of the dikes and within RDU 8:
 - o Within 1000 feet of the nearest RDU 8 boundary: When dust begins to move in the direction of the boundary, operations will be suspended. This will aid in preventing dust migration outside of the boundary and may require treatment of these areas during periods of no wind or a steady breeze away from the boundary.
 - o Further than 1000 feet from the nearest RDU 8 boundary: When dust does not settle to the ground before reaching 1000 feet of the boundary, operations will be suspended. This will require close monitoring of the plume during these operations.

Revisions required:

Page 14, 2nd paragraph, change "from lime treatment operations" to "during lime delivery and storage operations"

Delete 4th bullet

Add new paragraph as follows:

The specific process that will be utilized to control dust generated from lime treatment operations is outlined as follows:

- o *Within the cells of the Opportunity Ponds: When dust from lime application approaches the perimeter dikes, operations will be suspended.*
- o *In upland areas outside of the dikes and within RDU 8:*
 - o *Within 1000 feet of the nearest RDU 8 boundary: When dust begins to move in the direction of the boundary operations will be suspended.*
 - o *Further than 1000 feet from the nearest RDU 8 boundary: When dust does not settle to the ground before reaching 1000 feet of the boundary, operations will be suspended.*

- o *Prior to application of lime, conditions will be assessed to determine if lime spreading can be performed without impacting off-site areas. The wind speed and direction will be assessed to determine if a migrating lime plume will move in the direction of homes or livestock and if a plume is generated, how quickly it will move across the landscape.*
- o *The moisture content of the lime to be used and the lime rate will be evaluated to determine how much lime may be expected to create a plume.*
- o *If conditions appear satisfactory to apply lime without migrating beyond the allowable limits, begin lime application but continue to monitor conditions to determine if the operation should be suspended for a limited period of time, shut down for the day or moved to a different area.*

3.2.2 Polymer Surfactant Application

Comments:

All open tailings areas, with the exception of areas of saturated tailings, must receive an initial application of polymer surfactant in 2007, regardless of vegetation or a lime rock layer. Areas with vegetation or a lime rock layer were given a lower priority in 2006 due to the limited window for application of polymer surfactant until cold weather shut down the operation. These areas are still susceptible to migration of windblown tailings.

Current areas of saturated tailings may dry out as more haul roads are constructed, limiting the amount of storm water runoff that accumulates in low spots. As these areas dry out, polymer surfactant must be applied.

Revisions required:

First Bullet, change "that have the potential to generate windblown dust" to "with the exception of areas of saturated tailings"

Third Bullet, replace this with "Additional tailings areas that were saturated in 2007 and subsequently dry out due to construction of haul roads or other conditions will receive polymer surfactant as needed until final reclamation is complete."

**ANACONDA SMELTER NPL SITE
ANACONDA REGIONAL WATER, WASTE & SOILS
OPERABLE UNIT**

Final

***Opportunity Ponds Remedial Design Unit (RDU) 8
Dust Management Plan***

Atlantic Richfield Company

March 2007

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1.0 INTRODUCTION

This Dust Management Plan has been prepared to present the dust management activities being implemented at the Opportunity Ponds Remedial Design Unit (RDU) 8 in conjunction with remedial construction activities. The requirements outlined in this plan are specifically adapted to the location, working conditions, and resources at the RDU 8 site and many of the procedures could not be successfully implemented at other sites. Construction activities are currently being undertaken by Montana Department of Environmental Quality (MDEQ) at the Streamside Tailings Operable Unit (SST OU) and by Atlantic Richfield Company (Atlantic Richfield) under the approved *Final Opportunity Ponds Remedial Design Unit (RDU) 8 Remedial Action Work Plan/Final Design Report (RAWP/FDR)* (Atlantic Richfield, 2006). Remediation activities are anticipated to continue through 2011. Additional RDU 8 remedial action construction activities are anticipated in association with the Clark Fork River (CFR) OU and Milltown Reservoir Sediments (MRS) OU Remedial Actions. The RDU 8 site location is shown on Figure 1. The RDU 8 design includes construction of engineered soil covers, soil treatments, borrow development, uplands revegetation, wetlands creation/enhancement, and ground water and storm water controls, which are all approved for remediation and final closure of RDU 8. This Dust Management Plan is intended to outline current remedial action construction practices and associated Best Management Practices (BMPs) to be implemented by all parties completing construction activities at RDU 8. This Dust Management Plan also provides for PM-10 monitoring of particulate matter potentially emanating from the RDU 8 site and outlines additional alternatives/BMPs that may be evaluated if PM-10 monitoring suggests additional BMPs or remedial action construction modifications are necessary.

Although not a highly populated area, the remedial construction activities are in close proximity to the surrounding communities of Anaconda and Opportunity, Montana and are located immediately adjacent to Montana Highways 1 and 48 and U.S. Interstate 90. The large scale of the remedial construction activities is evident to both the residents of the nearby communities and those passing by on the adjacent roadways.

The primary source of fugitive dust appears to be the C-Cells portion of the Opportunity Ponds. Secondary sources of dust include soil borrow operations, soil cover installation activities, and the Opportunity Ponds D2-Cells. This report summarizes mitigative actions and/or BMPs which have been implemented by all parties and/or will be implemented to address concerns with dust originating from ongoing Remedial Action activities. In addition, an air quality monitoring program using high volume (PM-10) air samplers will continue to be implemented to evaluate ambient air quality in the vicinity of the Opportunity Ponds and evaluate the effectiveness of mitigative actions and BMPs implemented to control fugitive dust at the Opportunity Ponds.

1.1 Site Description

RDU 8 is located northeast of Anaconda, Montana and includes a large tailings impoundment (the Opportunity Ponds) and surrounding adjacent acreage as shown on Figure 1. The RDU 8 site is one of 17 RDU's and 2 expansion areas comprising the Anaconda Regional Water, Waste, and Soils (ARWW&S) Operable Unit (OU) of the Anaconda Smelter National Priorities List

(NPL) Site. The Opportunity Ponds RDU 8 is entirely owned by the Atlantic Richfield Company (Atlantic Richfield). The RDU 8 boundary encompasses approximately 7,388 acres and is defined as follows:

1. On the south by Montana Highway 1 to its intersection with Mill Creek, thence following Mill Creek to its intersection with the southern Atlantic Richfield property boundary (north of Opportunity) to the east side of Opportunity; thence east to the approximate western floodplain boundary of Willow Creek; thence north along the floodplain boundary of Willow Creek to the Mill/Willow Bypass; thence north along the Mill/Willow Bypass to the Montana Rail Link railroad;
2. On the east by the Burlington Northern Santa Fe (BNSF) railroad adjacent to the I-90 Frontage Road;
3. On the west by Montana Highway 48; and
4. On the north of Montana Highway 48 to its intersection with the east section line for Section 23; thence south along this section line to the north section line for Section 25, and east to its intersection with the BNSF railroad.

The primary feature within RDU 8 is the Opportunity Ponds tailings impoundment, which contains approximately 130 million cubic yards (cy) of tailings ranging from 5 to 50 feet deep and covers approximately 3,181 acres. The tailings ponds were formed by the placement of rock fragments separated from metal bearing minerals that were considered wastes and discarded in the tailings ponds. Ore processed at the Anaconda Reduction Works was predominantly from the Butte Mining District. The Opportunity Ponds were established in 1914. Active disposal of mill tailings at the Opportunity Ponds was continuous from 1914 through 1964. Subsequent disposal continued intermittently until smelter operations ceased in 1980.

The Opportunity Ponds are divided internally into the Opportunity Triangle Area (OTA) and A, B, C, and D-Cells. Each major cell is further divided by a series of internal dikes into subcells (i.e., B1, B2, C1, etc.). The Opportunity Ponds dikes range in height from approximately 10 to 50 feet. The OTA, A-Cells, and the C2.1 Cell areas were reclaimed under previous remedial actions as shown on Figure 2. Remaining portions of the B, C, and D Cells have recently been reclaimed or are in the process of being remediated during the ongoing remedial action construction activities, which are discussed in Sections 1.1.1 and 1.1.2. Remediation through establishment of a vegetative cover is the most effective type of long-term dust control. Permanent vegetative cover is the ultimate goal for the ponds.

1.1.1 Opportunity Ponds

The Opportunity Ponds are located within the RDU 8 boundary and have been designated as a Waste Management Area (WMA) under the 1998 U. S. Environmental Protection Agency (EPA) ARWW&S OU *Record of Decision* (ROD). The Opportunity Ponds WMA was established because the removal of waste materials and the restoration of ground water within this area were determined to be technically impracticable and cost prohibitive. Waste materials within the WMA are to be closed in-place primarily through construction of a permanent vegetative cover over the existing tailings and consolidated waste materials and establishment of vegetation over impacted soils, and imported materials. Permanent vegetative covers will consist of soil covers,

and *in-situ* treatment of consolidated impacted soils and imported materials. Permanent vegetative cover remedies will be implemented within the Opportunity Ponds.

Borrow soil obtained from on-site locations (within RDU 8) and imported materials obtained from off-site locations will be required to construct the permanent vegetative covers discussed above. Approximately 1,019 acres of potentially developable borrow areas have been identified within RDU 8, which are divided into primary regions and sub-regions according to soil types. On-site borrow locations have been permitted under the Montana Department of Environmental Quality (MDEQ) – Industrial and Energy Minerals Bureau – Open Cut Program as soil and gravel borrow areas. A copy of these permits and approved reclamation plan is on file at MDEQ. All borrow soil within these areas have been identified through borrow investigations and subsequent evaluations. Of the 1,019 acres of developable borrow areas; approximately 820 acres have been selected for excavation of approximately 2.0 million bank cubic yards (mbcy) of soils (Type A material) and 3.2 Mbcy of alluvium (Type B material) for the construction of soil covers.

1.1.2 Upland Areas

Approximately 755 acres of upland areas exist within RDU 8 that are outside of the Opportunity Ponds WMA area. Delineated upland areas contain surface soils that have been impacted by aerial and fluvial deposited wastes. These upland areas will primarily be remediated through establishment of a vegetative cover on impacted areas. Treatment options for these areas include:

- No Action for existing well vegetated areas;
- Selective stripping and consolidation of materials exceeding action levels;
- Soil tillage;
- Incorporation of lime into the soil; and
- Seeding, fertilizing, and installation of organics.

1.2 Site Setting

1.2.1 Climate

Anaconda, Montana, has a semi-arid climate characterized by long and cold winters, relatively cool summers, light precipitation, and moderate winds. The average annual precipitation measured at the East Anaconda weather station for the period of 1951 through 1974 was 13.7 inches, while the average evaporation occurring between April and November (measured in 1974 and 1978) was 48.9 inches. Approximately two thirds of the average precipitation occurs between April and September, with approximately one half of this amount occurring during May and June (Tetra Tech, 1987).

1.2.2 Topography

Topographic mapping has been generated from aerial photographs taken in October 1999. Other planimetric features have also been delineated during the mapping. The Opportunity Ponds land slope within RDU 8 is toward the east-northeast at an overall grade of approximately 1%. The Opportunity Ponds are elevated compared to the surrounding terrain, with perimeter dikes sloping down at 5H:1V and steeper.

1.2.3 Wind

Historic meteorological data, including wind speed and wind direction has been collected from multiple locations in close proximity to RDU 8. One historic location, the Mill Creek Park station, is shown on Figure 2. Wind direction (pre-dominant and secondary) and wind speeds (average annual and maximum hourly) collected during three separate monitoring periods (from August 1989 to June 1992) for each station are presented in Table 1.

As summarized in Smelter Hill Remedial Investigation Report - Air Resources Investigation (ARCO 1990, 1991 and 1992), the predominant wind direction at the Mill Creek Park site during each of the three monitoring periods was south westerly. The meteorological data for this site show a bimodal flow from the southwest and north-northeast along the axis of the Mill Creek drainage. The average annual wind speeds at the Mill Creek Park site ranged from 10.2 to 10.7 miles per hour (mph) with maximum hourly averages approaching 40 miles per hour.

Recent meteorological wind speed and direction data obtained from the former wind turbine, located near the RDU 8 OTA construction trailers, confirmed that the average wind direction is out of south-southwest. The average wind speed at this location from September 5, 2005 through April 2006 was 12 miles per hour and maximum observed wind speed at the job trailer was 71 mph.

Current meteorological wind speed and direction data collected from the Opportunity Ponds anemometer located within the B-Cells shows the predominant wind direction out of the south-southwest. The average wind speed at this location is 13 mph and the highest measured wind speed is 51 mph. A wind rose from the Opportunity Ponds anemometer is shown on Figure 3.

1.2.4 Geology

The Opportunity Ponds were constructed on Quaternary glacial outwash and alluvial sediments consisting of gravels, sands, and silts. Carbonate-rich alluvium or a peat/clay lens located beneath the tailings has the ability to neutralize or attenuate metals in water draining from or infiltrating through the tailings, *Anaconda Regional Water and Waste Operable Unit, Final Remedial Investigation (ARWW OU Final RI)* (ARCO, 1996).

The western edge of the Deer Lodge Valley is defined by the movement of normal, east-dipping faults. One major north-south fault cross cuts into the Smelter Hill subarea, where it offsets the Tertiary Lowland Creek Volcanics and Quaternary fan deposits. The actual location of the fault is approximated through the Anaconda Ponds RDU 4 area due to the presence of sinter,

colluvium, and mine wastes. This fault shows no obvious connection to the numerous springs in the area, but could have been a conduit between the two inactive geysers and deep, magmatically-heated geothermal fluids. This fault is the probable cause for the increase in depth of glacial alluvium between the Anaconda Ponds and Opportunity Ponds. Minor west-dipping faults also occur in the Anaconda Ponds area, and are responsible for the offset of upper-level basin fill near the western side of the Deer Lodge Valley.

1.2.5 Hydrogeology

In general, the primary Opportunity Ponds aquifer is an unconfined alluvial aquifer comprised of Quaternary glacial outwash. The two glacial outwashes emanating from the Mill Creek and Warm Springs Creek valleys have created a merged alluvial fan in the Opportunity Ponds area. Alluvial thickness beneath the Opportunity Ponds RDU 8 reaches upwards of 5,000 feet (*ARWW OU Final RI* [ARCO, 1996]) due to the half graben structure of Deer Lodge Valley. Ground water in the upper 150 feet of the Opportunity Ponds aquifer flows to the east and northeast, generally matching the surface topography. Bordering to the east of the Opportunity Ponds is the Quaternary alluvium of the Clark Fork River, and the unconsolidated Tertiary alluvium deposits near the Warm Springs Ponds.

2.0 AIR QUALITY MONITORING

2.1 Historic Monitoring

Air quality has been monitored in the vicinity of the Anaconda Smelter NPL Site at several locations intermittently since the 1970s. Sample locations were selected to measure the representative levels of dust in representative receptor areas, generally downwind of the wastes with the highest elevated metals. Historic sample locations are shown on Figure 2.

Historically, air quality monitoring in and around the Anaconda Smelter NPL Site has not shown exceedances of federal standards. Monitoring of air quality was previously performed at the Teresa Ann Terrace (Site 1), Kortem Storage (Site 2), Mill Creek Park (Site 3), and Zinc Processing Area on Smelter Hill (Site 4) during the Air Resources Investigation associated with the Anaconda Smelter RI (ARCO, 1990, 1991 and 1992). During the three annual monitoring periods at each station, there were no apparent changes or trends in PM-10 metals or settled particulate matter concentrations and there were no exceedances of federal ambient air quality standards. The resulting RI review and summary of air sampling results from 1989-1992 states: “Based on these results, the transport rate of contaminants via the air pathway from the Smelter Hill Subarea to surrounding lands is considered negligible.” In accordance with Agency approval, the monitoring stations used during the Air Resources Investigation were shut down and monitoring was discontinued.

Personal air monitoring was conducted by Jordan Contracting Inc. (JCI) in 2002 to determine potential exposure to heavy metals in dust encountered by JCI employees working on the Anaconda Smelter NPL site. All of the results were well below the OSHA Permissible Exposure Limits (PELs).

A July 2003 Industrial Hygiene Report produced by Liberty Northwest (JCI insurance carrier) during remediation of the A Cells portion of the Opportunity Ponds found that equipment operators onsite were well below the Recommended Control Limits (RCL) for exposure to metals, silica and respirable dust (Liberty Northwest, 2003). That study found that most of the samples collected were below the laboratory detection limits for these parameters.

Personal air monitoring was conducted by Montana Tech students on JCI employees at the Opportunity Ponds in the spring of 2006 (JCI, 2006). All results were below the OSHA PELs.

2.2 Current Monitoring

To further address fugitive dust, Atlantic Richfield and MDEQ (SST OU) have developed a Monitoring Plan for ambient air quality around the perimeter of the RDU 8 to better assess the fugitive dust, evaluate the effectiveness of implemented fugitive dust BMPs and allow for implementation of the appropriate mitigation measures.

Two high volume (PM-10) samplers were installed at each of two monitoring sites in proximity to the ongoing remedial activities within RDU 8. Figure 3 shows the location of the two monitoring sites and the current wind direction (wind-rose) data within the RDU 8 site. The first monitoring site (the North Monitoring Site) is situated near the northern boundary of RDU 8 and was located according to predominant historic and current wind direction data. The second monitoring site (the South Monitoring Site) is situated near the southern boundary of RDU 8 and was located with the intent of being directly in between the Opportunity Ponds and the town of Opportunity, Montana. The Dust Management Plan was developed to measure the concentrations of particulate matter with an aerodynamic diameter of 10 microns or less. The 10 micron fraction is the regulatory criteria used for fugitive dust from industrial operations, construction and demolition activities and agricultural and mining operations. In accordance with MDEQ discussion, the two samplers at each site collect a sample of the ambient air quality on a staggered one-day-in-six schedule so that a sample is collected from each monitoring site every 3 days. A more detailed description of the monitoring program is provided in the Ambient Air Monitoring Program Plan attached to this report as Appendix A. If air quality monitoring identifies exceedances of the standards identified, then additional construction and/or dust control BMPs will be evaluated and implemented, as necessary, to minimize dust in the area.

3.0 SITE DUST CONTROL

This section describes the remedial action construction measures that have been implemented or are in the process of being implemented to reduce dust within the RDU 8 site. The Opportunity Ponds Remedial Action is anticipated to be completed in 2011 with the primary goal of establishing vegetative covers over barren or sparsely vegetated areas, which will ultimately provide the best long term dust control within the site. Construction activities at the Opportunity Ponds are anticipated to be on-going 12 months of the year with short term shut downs possible during the winter months due to cold weather conditions.

Per Section 7.2.3 of the RDU 8 RAWP/FDR (Air Quality Standards), the RDU Boundary serves as the point of compliance for the contaminant-specific performance standards applicable to non-

construction areas (i.e. open tailings areas or completed actions). Section 7.4.1.1 of the RDU 8 RAWP/FDR (Air Requirements) identifies action-specific performance standards which require the use of Best Management Practices (BMPs) within the area of the RA/RD activities. It is expected that continued use of current practices and implementation of the BMPs outlined in this Dust Management Plan will achieve the objectives outlined in the RDU 8 RAWP/FDR. To assure that objectives outlined in this Dust Management Plan are being achieved on site, a new project Technical Specification Section 02400 and corresponding Construction Quality Assurance Plan (CQAP) Section 02400 have been developed, which are provided in Appendix B. The Technical Specification and CQAP outline specific dust control requirements to be followed by Contractors and Quality Assurance (QA) personnel during RA activities at the RDU 8 site.

3.1 Best Management Practices (Active Construction Areas)

This section outlines how dust will be minimized through the use of BMPs in active construction areas including haul roads, borrow areas, and cover installation areas. Each of the following subsections outline the specific dust control processes that will be implemented at each work area, the triggers that will be used to start or increase implementation of BMPs, and the conditions for shutting down operations before dust migrates beyond the point of compliance.

3.1.1 Haul Roads

The most common construction activity at the Opportunity Ponds involves hauling and placing cover materials over open tailings areas within the Opportunity Ponds. Cover materials include imported materials, which are generated from the MRS OU and SST OU as well as on-site RDU 8 materials that are developed from borrow areas just outside of the Opportunity Ponds. It is anticipated that cover materials in the future may include materials from the CFR OU. Due to the large size and soft tailings conditions of the Opportunity Ponds, an extensive network of haul roads is needed in order to haul and place cover materials over the tailings surface. The haul road network forms a large “grid” of elevated berms roughly 2 feet high and 50 feet wide that are constructed of coarse gravel material from on-site borrow areas. In many areas, the “grid” of elevated haul roads serves as wind break that reduces wind speeds and the potential for fugitive tailings dust from exposed portions of the Opportunity Ponds surface. Road dust that is generated from hauling activities typically is generated from the road surface (consisting of native alluvium material) as trucks haul cover material to the placement areas.

In order to minimize road dust during hauling activities, hauling operations are generally focused to use the fewest roads possible (considering two-way traffic safety) and haul truck speeds are kept at reasonable levels according to road conditions and the potential for generating road dust. Specific haul traffic patterns are established to limit un-necessary travel across haul roads outside of the active construction areas. Controlled access of the RDU 8 site limits the light duty vehicle traffic on site that can potentially cause road dust. In addition to site control and haul traffic management, the primary construction BMPs that are used to control haul road dust at the RDU 8 site include application of chemical surfactant to the haul road surface and routine haul road watering. The following sections describe each of these construction BMPs and outline how

they will be used at the RDU 8 site.

3.1.1.1 Chemical Surfactant

Chemical surfactants at the RDU 8 site are dust suppressant agents that provide long-term dust suppression on unpaved roads. The chemical surfactant that has primarily been utilized at the RDU 8 site is a liquid magnesium chloride solution that consists of a minimum 31% magnesium chloride, less than 1 percent calcium chloride, and less than 1 percent sodium chloride. A Material Safety Data Sheet (MSDS) for the magnesium chloride material is provided in Appendix C of this report. Use of magnesium chloride at the RDU 8 site has been demonstrated to significantly reduce haul road dust and reduce the need for watering on many of the existing main haul roads at the site. In 2006, an estimated 300,000 gallons of magnesium chloride chemical surfactant was applied to provide long-term dust suppression on approximately 25 miles of active construction haul roads within RDU 8. All main haul roads, which are generally defined as roads that are continually used by the majority of the hauling fleet, receive an initial application of magnesium chloride prior to any steady use. The initial application of magnesium chloride is typically applied at a rate of 0.5 gallons/square yard and is mixed in place within the top few centimeters of haul road material in order to establish a durable first coating. Since excess magnesium chloride can cause slick and unsafe driving conditions, the initial application rate has been carefully selected so that only the amount needed to suppress dust is applied. Once the initial application of magnesium chloride solution no-longer provides effective long term dust control (as indicated by an increased need for haul road watering), maintenance applications are typically sprayed over the road surface on an as-needed basis at a rate of approximately 0.1 gallons/square yard. Magnesium chloride solution is stored on site and is readily accessible for conducting maintenance applications if additional dust suppression is deemed to be required.

The specific process that will be utilized for applying surfactants to control haul road dust at the RDU 8 site during construction activities is outlined as follows:

- All main haul roads, generally defined as roads that are continually used by the majority of the hauling fleet, will receive an initial application of magnesium chloride at a rate of approximately 0.5 gallons/square yard.
- If a surfactant other than magnesium chloride is used, the initial application will be applied at a rate that provides equal or better long term dust control protection than the initial application of magnesium chloride.
- Magnesium chloride or other equivalent road sealer will not be applied to roads within the borrow areas due to borrow material quality issues and the temporary nature of these roads. In addition, magnesium chloride will not be applied to sloped surfaces that may promote unsafe driving conditions when wet.
- Additional maintenance applications of magnesium chloride will be performed (using on-site water trucks) if the initial application of magnesium chloride solution no-longer provides effective long term dust control (as indicated by an increased need for haul road watering).

3.1.1.2 Water

The most common BMP used in controlling dust during hauling activities is watering of the road surface. Weather conditions as well as the intensity of haul road usage are key factors in the effectiveness and overall intensity of haul road watering. Hot, dry, and windy conditions typically require frequent haul road watering since much of the applied water is lost to evaporation. In contrast, haul road watering during freezing temperatures must be performed with caution and in moderation since this activity can cause slick and unsafe driving conditions. Road watering is primarily focused on secondary roads or roads that have not received surfactant for longer term dust control. Watering of roads that have received surfactant can degrade the long term effectiveness of the surfactant material and is typically limited to a light water application at the beginning of hauling operations.

The frequency of haul road watering and the number of water trucks that are used to water haul roads during a given day depends on wind and weather conditions and construction activity. Generally, one water truck is assigned to each major truck hauling operation. In addition, during periods of extended dryness or when strong winds are experienced early in the day, efforts are made to increase resources (i.e. water trucks) and overall attention to site dust control. Multiple water trucks, including a high capacity water truck, have been employed at the RDU 8 site. The specific methods for applying water to control haul road dust during Opportunity Ponds construction activities are outlined as follows:

- All haul roads that will be utilized for hauling operations will be sprayed with water prior to hauling activity. To avoid slick or unsafe road conditions, pre-watering will not be completed during freezing temperatures or when recent precipitation eliminates the need for haul road watering.
- Haul roads that are actively being used within the Opportunity Pond construction area will receive water on an as needed basis so that dust does not migrate away from the haul roads (as demonstrated by observation of dust more than 200 feet from the active haul road). Roads to receive water primarily include secondary roads, roads that have not received surfactant, and borrow area haul routes.
- If BMPs currently in use fail to prevent dust from being generated by haul traffic (as demonstrated by observation of dust more than 200 feet from the active haul road) operations will be altered or suspended. Alterations include increasing the number of water trucks or concentrating the water trucks on dry roads or sections of roads. Haul routes may be changed to avoid dry roads until adequate water can be applied to prevent dust.
- If alterations or adjustments to BMPs fail to prevent dust from migrating away from the haul roads (as demonstrated by observation of dust more than 200 feet from the active haul road), hauling operations must be shut down and the BMPs re-evaluated prior to resuming haul.

3.1.2 Borrow Areas

The majority of soil material used to construct vegetative covers over the Opportunity Ponds surface will be obtained from two on-site borrow areas that are situated just outside of the Opportunity Ponds perimeter dikes. These include the East Borrow Area, which lies due east of the Opportunity Ponds D-Cells and encompasses approximately 600 acres, and the South Borrow Area, which lies south of the Opportunity Ponds B and C Cells and encompasses approximately 400 acres. Borrow operations will primarily be focused in the East Borrow Area for the first half of the project and in the South Borrow Area for the last half of the project. Construction activities associated with borrow development that may potentially generate dust include stripping surface soils, stockpiling different types/qualities of borrow materials, and loading borrow materials into haul trucks. The following sections outline the methods for minimizing construction dust in the borrow areas according to each specific borrow operation.

3.1.2.1 Excavation and Loading

Excavation and loading activities typically involve digging with an excavator or “pushing” borrow material with a bulldozer into a stockpile and loading the stockpiled material into haul trucks. The stockpiling process helps control the quality of the soil material and keeps the different types of borrow material separated. The excavation and loading areas are continually changing and advancing as borrow material is excavated/depleted throughout the borrow area. In most cases, the excavation and loading operation is carried out on top of an exposed alluvium working surface that contains a large amount of coarse (larger sized) rock. Because of the coarse nature of alluvium material and the slower speeds of the equipment in the loading area (due to stopping and starting), the working surface does not as readily contribute to large amounts of windblown dust. Nevertheless, dust can be generated in the excavation and loading areas that can be minimized by watering the working surface. The methods for controlling dust at excavation and loading areas within the Opportunity Ponds borrow areas are outlined as follows:

- Soils to be stripped from the surface of borrow area will be pre-watered if necessary so that windblown dust does not expose workers to unacceptable levels of dust (per OSHA 29 CFR 1910.1000), does not impair visibility of operators and drivers, and does not impact adjacent materials with rogue waste.
- All excavation and loading areas, specifically including the ingress and egress routes utilized by haul trucks, will be sprayed with water prior to any hauling activity. To avoid slick or unsafe conditions, pre-watering will not be completed during freezing temperatures or when recent precipitation eliminates the need for watering.
- Active excavation and loading areas within the borrow areas will receive water on an as needed basis during operations so that dust does not expose workers to unacceptable levels of dust (per OSHA 29 CFR 1910.1000), does not impair visibility of operators and drivers, and does not impact adjacent materials with rogue waste.

- If dust caused by excavation and loading operations creates a dust cloud over 50 feet high lasting for 5 minutes or more, these activities will be suspended or moved until BMPs can mitigate generated dust.
- If dust caused by excavation and loading operations migrates outside of the designated borrow boundaries, these activities will be shut down and the BMPs re-evaluated prior to resumption of activities to assure that dust does not again migrate outside of the boundaries.

3.1.2.2 Borrow Areas

The process of stripping or excavating borrow materials from the borrow areas often exposes open areas of disturbed, non-vegetated soils that can contribute to windblown construction dust. Disturbed soils that have the greatest potential to cause windblown dust are those that have fine texture and low rock content since smaller soil particles can more readily be picked up and carried by the wind. Specific to the RDU 8 project, these materials include Type E material, which typically consists of the upper 6-inches to 1 foot of surface soils that are stripped off the borrow areas, and Type A material, which consists of standard “cover soil” material that lies directly below the surface soil. After these materials are excavated, coarse alluvium materials (Type B material) are exposed, which are less likely to cause windblown dust. Dust from active borrow areas can be minimized by watering and from inactive borrow areas through the establishment of a temporary vegetative cover.

Large areas of exposed Type E and A materials within the borrow areas generally are not temporary seeded because the materials are excavated and moved within a short period of time. In borrow areas that have been completely excavated to final grade, windblown dust from the exposed alluvium surface can be further minimized by implementing temporary vegetation until the final closure process begins. An estimated 400 acres of exposed alluvium in depleted borrow areas will receive temporary seeding in 2006 in order to minimize potential for fugitive dust in these areas. The specific process that will be utilized to control dust generated from open areas of Type E, A, and B material within the borrow areas is outlined as follows:

- Active areas of exposed Type E and A material that will be worked or excavated within a 6 month time period will receive water on an as needed basis so that windblown dust does not expose workers to unacceptable levels of dust (per OSHA 29 CFR 1910.1000), does not impair visibility of operators and drivers, and does not impact adjacent materials with rogue waste.
- Inactive areas of exposed Type E, A, and B material that are not anticipated to be worked or excavated within a 6 month time period will receive temporary seeding within 6 months following construction activity and no later than soil freeze-up in any year. Vegetative cover from temporary seeding must be successful to the extent that migration of materials does not occur.
- If dust caused from active or inactive borrow areas migrates outside of the designated borrow boundaries, open areas must be watered and stabilized with straw mulch, surfactant, or other

approved method. Borrow area BMPs must be re-evaluated prior to resumption of activities to assure that dust does not again migrate outside of the boundaries.

3.1.2.3 Borrow Material Stockpiles

Windblown dust can be generated from stockpiles of loose or exposed soil that remain in the borrow areas. Stockpiles of fine textured materials such as rogue waste (Type D material), impacted soils (Type E material) and cover soil (Type A material) are the most prone to causing windblown dust. For materials that are stockpiled for a relatively short period of time, windblown dust can be minimized through routine watering. For materials that are stockpiled for a longer period of time, dust is typically minimized through the implementation of a temporary vegetative cover. To date, no stockpiles of Type D or E material have received temporary seeding because the stockpiles have been hauled away within a short period of time and/or have not caused significant amounts of windblown dust. In 2006, temporary seeding was completed over approximately 30 acres of stockpiled Type A material that will remain in the East Borrow Area for an extended period of time. Un-vegetated stockpiles of Type A material within the South Borrow Area will be temporary seeded in 2006 in conjunction with exposed alluvium in adjacent areas, as discussed in Section 3.1.2.2. The specific methods that will be utilized to control dust generated from borrow material stockpiles is outlined as follows:

- All stockpiles of Type D material will receive water on an as needed basis so that windblown dust does not expose workers to unacceptable levels of dust (per OSHA 29 CFR 1910.1000), does not impair visibility of operators and drivers, and does not impact adjacent materials with rogue waste. Water will be applied when dust is visibly migrating from the stockpiles during a 20 mph or less wind event.
- Stockpiles of Type D material will be hauled away and consolidated within 3 months following stockpiling.
- Temporary stockpiles of Type E and A material that will be worked or moved within a 6 month time period will receive water on an as needed basis so that windblown dust does not expose workers to unacceptable levels of dust (per OSHA 29 CFR 1910.1000), does not impair visibility of operators and drivers, and does not impact adjacent materials with rogue waste. Water will be applied when dust is visibly migrating from the stockpiles during a 20 mph or less wind event.
- Temporary stockpiles of Type E and A material that are not anticipated to be worked or moved within a 6 month time period will receive temporary seeding within 6 months following construction activity and no later than soil freeze-up in any year. Vegetative cover from temporary seeding must be successful to the extent that migration of materials does not occur.
- If dust from stockpiles migrates to clean soil areas or outside of the designated borrow boundaries, BMPs have failed and the stockpiles must be watered, kept moist, and removed as soon as possible or controlled such that no further dust migration occurs. Stockpiling of

this type of material will be suspended immediately and not be resumed until BMPs are re-evaluated to assure that dust can be controlled on future stockpiles.

3.1.3 Cover Installation Operations

Installation of a permanent vegetative cover over the Opportunity Ponds tailings is a primary goal of the RDU 8 construction project and will ultimately provide the most effective long-term dust control within the site. Covers are constructed of soil material that is typically placed over the tailings in a layer, or “lift”, ranging between 18 and 22 inches thick. Some of the placed materials require lime amendment in order to neutralize soil acidity, as determined by sampling and testing that is conducted after the material is placed. During the cover installation process, windblown dust can be generated from exposed soils at the cover lay down areas as well as from lime treatment activities. The following sections outline the methods that will be followed for minimizing construction dust during each phase of the cover installation process.

3.1.3.1 Lay Down Areas

Lay down areas are generally defined as areas where soil materials are actively being hauled and placed over the tailings surface, but the final cover is not yet complete. Final soil covers are complete once the cover material is in place, soil amendments are incorporated, and final seeding performed. Construction BMPs, including surface watering and temporary seeding, can be used to minimize dust from the exposed surface of soil materials in the lay down areas until final seeding is complete. The specific process that will be utilized to control dust generated from cover material placement operations is outlined as follows:

- In locations where a water truck can access cover placement areas, recently placed cover materials that have been installed to final grade will receive a one-time heavy surface application of water to help minimize the potential for dust generation from the exposed soil surface until amending with lime or organics or seeding. Lay down operations shall be sequenced, and water trucks made available, so that most material at final grade can be accessed and watered. If watering is not possible, other BMPs may be required.
- Cover materials that have been installed to final grade and either: 1) do not require lime amendment; or, 2) have received lime amendment (including mellowing); will receive final seeding during the next spring or fall seeding window per Section 02910 of the project Technical Specifications. If limed materials cannot be seeded during the next seeding window due to mellowing or poor seed bed due to fluff or other conditions, straw mulch, surfactant or other dust control BMPs will be implemented.
- Placed cover materials that are not anticipated to be treated with lime or final seeded within a 6 month time period will receive temporary seeding as soon as possible after placement, within 6 months following construction activity and no later than freeze-up in any year. Vegetative cover from temporary seeding must be successful to the extent that migration of materials does not occur.

- Impacted soils and imported materials will be sampled to determine if lime is required within 2 months of placement so that a determination can be made as to whether these areas can be seeded during the next seeding window. Any areas that cannot be sampled within two months will receive temporary seeding.
- If dust from any lay down area migrates over 1000 feet in a 20 mph or less wind, mulch or surfactant must be applied to the surface as soon as weather permits.

3.1.3.2 Lime Amendment

Lime amendment is performed to neutralize the acidity of both impacted cover materials that are placed over the Opportunity Ponds surface as well as other impacted surface soils surrounding the Opportunity Ponds that will be treated in place. The lime amendment process involves applying lime over the surface of the material to be amended at a specified rate (based on soil acidity) and incorporating the lime into the soil profile to the design specified depth. The lime material that has primarily been utilized at the RDU 8 site consists of lime kiln dust, which is a lime byproduct that is commonly referred to as LKD. An MSDS for the lime material that is primarily being used at the site is included in Appendix C. Lime materials utilized at the RDU 8 site are typically dry and fine in nature making them susceptible to causing windblown dust.

Lime material is normally delivered to the site in pneumatic trucks and is offloaded into covered stockpiles located either within or just outside of the Opportunity Ponds containment dikes. During offloading, compressed air “pushes” the lime out of the truck tanks and through a distribution hose that is placed underneath the tarp covering the lime stockpile. The lime material is typically well contained during offloading and storage and very little dust is usually generated during these stages of the operation. Lime application and incorporation are successive operations that are usually completed on warm, dry days when the materials to receive lime amendment are not wet or frozen. The lime application process involves removing tarps from the lime stockpile, loading the lime from the stockpile into the lime spreading equipment (Terragator), and applying the lime at the prescribed rate over material to be amended. The majority of windblown dust generated during the lime amendment process occurs during lime application. To control dust during lime application, lime spreading is done in low wind conditions with lime application operations being shut down when steady wind conditions blow lime dust off of the RDU 8 site. Lime incorporation is completed immediately following lime application to the extent possible and no later than 8 hours after application to minimize fugitive dust. The lime incorporation process typically does not generate significant amounts of dust. The specific methods that will be utilized to control dust generated during lime delivery and storage operations is outlined as follows:

- Lime will be covered or contained in pneumatic tanks during delivery to the site.
- All inactive lime stockpiles that have potential to generate windblown dust will be covered with tarps that will be maintained or replaced as necessary.

- Active lime stockpiles that are being used for lime treatment operations will be sprayed with water to create a surface crust at the end of each work day or when there is potential for the stockpile to cause significant windblown dust.

The specific methods that will be utilized to control dust generated from lime treatment operations is outlined as follows:

- **Liming operations which occur within 1000 feet of the RDU 8 boundary:** When dust from the lime operations migrates in the direction of the boundary, operations will be suspended.
- **Liming operations which occur further than 1000 feet from the RDU 8 boundary:** When dust from the lime operations does not settle to the ground before reaching 1000 feet of the boundary, operations will be suspended.
- Prior to application of lime, conditions will be assessed to determine if lime spreading can be performed without impacting off-site areas. The wind speed and direction will be assessed to determine if migrating lime will move in the direction of homes or livestock and if dust is generated, how quickly it will move across the landscape.
- The moisture content of the lime to be used and the lime rate will be evaluated to determine how much lime may be expected to create dust.
- If conditions appear satisfactory to apply lime without migrating beyond the allowable limits, begin lime application but continue to monitor conditions to determine if the operation should be suspended for a limited period of time, shut down for the day or moved to a different area.

3.2 Fugitive Dust Mitigation (Inactive Open Tailings Areas)

Inactive areas are generally defined as open areas within the Opportunity Ponds that have not received either a temporary or final cover and, therefore, remain as a potential source for windblown dust. Some of these inactive areas have greater potential for causing windblown dust than others. Typically open tailings areas that are saturated or areas where a previously installed lime rock layer is still in-tact do not generate significant amounts of windblown dust. Conversely, open tailings areas that are dry and do not contain a surface lime rock layer have greater potential to generate windblown dust. Inactive areas with high potential for generating windblown dust have been targeted to either receive final soil cover, partial soil cover or temporary polymer surfactant cover as soon as possible. Many of these high potential areas were addressed in 2006, however, management of dust in these areas will be an ongoing process until final or partial covers are in place. The systematic approach for installing covers or applying temporary polymer surfactant covers to control fugitive dust from inactive areas within the Opportunity Ponds is further detailed in the sections to follow.

3.2.1 Cover Installation/Sequencing

Cover placement operations at the Opportunity Ponds have been scheduled or “sequenced” with the primary goal of covering exposed tailings areas in order from highest to lowest dust generating potential. In some cases, the schedule for final cover placement is limited to the availability of cover materials that will be generated from areas outside of the Opportunity Ponds. Final covers that will be constructed with SST OU and MRS OU materials, for example, will be completed as the materials arrive at the site according to reclamation requirements and regulatory decisions specific to those sites. In light of these factors, the project sequencing has been optimized for covering tailings with the highest wind blown dust potential with the most readily available cover materials. The overall approach for installing covers over each of the major Opportunity Ponds cells in order to minimize fugitive dust is outlined in the sections to follow.

3.2.1.1 Opportunity Ponds C2 Cells

Under the approved RDU 8 RAWP/FDR schedule and work sequencing plan, the Opportunity Ponds C2-cells were not scheduled to receive final cover until 2008, when the bulk of the MRS OU materials are expected to arrive at the site. As a result of observed fugitive dust emanating from the C2.11, C2.12 and other portions of the C2 Cells in the spring of 2006, work activities were re-sequenced to focus full construction efforts on installing final and partial covers in RDU 8 C2-cells. The goal of the re-sequencing was to complete final cover in the most problematic areas of the C2 Cells, including the C2.11 and C2.12 Cells, in 2006. Recent construction progress indicates that the cover placement operations in the C2.11 and C2.12 Cells are on schedule and will be completed before the end of 2006.

A secondary goal of the re-sequencing was to complete final cover in the entire C2 Cells by 2007. By the end of the 2006 construction year, over 70% of the C2 Cells will have been covered with either a partial or complete final cover. Cover placement operations in the C2 cells have been further prioritized to maximize the coverage of exposed tailings, where possible. When constructing covers that consist of two layers, for example, the lower layer is installed to cover as much area as possible and the upper layer is postponed so that more material can be hauled to cover exposed tailings elsewhere. The lower (partial) layer is then completed within 6 months or temporary seeded as outlined in Section 3.1.3.1. Remaining open portions of the C2 cells that were not anticipated to receive soil cover by the end of 2006 received polymer application in the fall of 2006, which is further discussed in Section 3.2.2. Based on current production rates, construction of final cover in the C2 Cells is anticipated to be completed within the 2007 year end goal.

3.2.1.2 Opportunity Ponds C1 Cells

The C1.5 Cell encompasses the eastern half of the Opportunity Ponds C1 Cell and is considered to be the driest portion of the cell with the greatest potential to cause windblown dust. Approximately 30% of the C1.5 Cell has received final cover and seeding, which has helped reduce the dust generation potential of the cell. Remaining open portions of the C1.5 Cell that have potential to generate windblown dust received polymer application in 2006, as outlined in

Section 3.2.2, in order to minimize dust from these areas. The placement of final cover in the C1.5 Cell will resume following cover completion in the C2 Cell. The C1.1 – C1.4 Cells make up the western half of the C1 Cells and have relatively low potential to generate fugitive dust due to the presence of existing vegetation and high moisture content in the tailings surface. Portions of the C1.1 – C1.4 Cells that have been identified as potential dust source received polymer application in 2006, which is further outlined in Section 3.2.2. The placement of final cover in the C1.1 – C1.4 Cells is anticipated to begin following cover completion in the C1.5 Cell.

3.2.1.3 Opportunity Ponds B2 Cells

Portions of exposed tailings in the Opportunity Ponds B2.12 Cell were identified as a dust source in 1998 and were covered with 12 inches of clean gravel alluvium that same year. Since that time, the B2.12 Cell has been used by MDEQ (SST OU) for placement of materials from SST OU. The MDEQ SST OU operations at RDU 8 are carried out consistent with the construction BMPs outlined in this plan. The B2.4 through B2.13 Cells, which essentially make up the southern half of the B2 Cell, have previously been covered with material from the Streamside Tailings Operable Unit. Approximately 25% of these cells received final cover and final seeding in the fall of 2006. The remaining 75% are anticipated to receive lime amendment or temporary seeding in 2006. The B2.1 – B2.3 Cells, located west of the Opportunity Ponds railroad spur, received temporary covers and seeding in 2006.

3.2.1.4 Opportunity Ponds B1 Cells

The B1.1 Cell was covered with material from the Streamside Tailings Operable Unit in the summer of 2006 and received temporary seeding in the fall of 2006. The placement of SST OU materials will continue to advance eastward at a completion rate that will be dictated by remedial activities conducted by MDEQ (SST OU). Areas identified as having potential to generate windblown dust, specifically including the B1.2 through B1.9 Cells, received temporary polymer application in 2006, as outlined in Section 3.2.2.

3.2.1.5 Opportunity Ponds D Cells

As a result of the 2006 project re-sequencing, the Opportunity Ponds D1 and D2 Cells will be covered with MRS OU materials. The material placement is currently anticipated to start in 2008 with cover placement complete for the D-Cells in 2010. In order to minimize dust until final cover is completed in the D Cells, exposed tailings areas that have been identified as potential dust generating sources have received polymer application, which is further addressed in Section 3.2.2.

3.2.2 Polymer Surfactant Application

Polymer surfactant, otherwise known as polyvinyl acrylic polymer (PVA), is a liquid tackifier that is sprayed on loose soil to physically bond soil particles together and hold it in place. Polymer surfactant is used in many parts of the nation to control dust from open tailings impoundments and has been applied over the exposed Opportunity Ponds tailings surface to minimize fugitive dust. The polymer surfactant that is currently used on the Opportunity Ponds

is a non-toxic and environmentally safe material that is commercially identified as Envirotac II. An MSDS for the Envirotac II material is provided in Appendix C. The polymer material is delivered to the site in concentrated liquid form and is mixed with water to achieve the desired concentration before it is sprayed on to the soil surface. When applied to the tailings surface, the liquid solution penetrates into the soil and forms a durable plastic and resin bond that provides good protection against wind erosion. Polymer surfactant coatings typically provide effective dust control for periods of 12 months or greater, depending on the application rate, weather conditions, and the amount of disturbance over the applied surface.

Currently on the Opportunity Ponds, the initial coating of polymer surfactant is applied to the tailings surface at a rate of approximately 150 gallons/acre. Once the initial polymer coating degrades and loses effectiveness, additional maintenance coatings may be necessary to minimize potential for windblown dust until final cover is placed. To date, polymer surfactant has been applied to approximately 950 acres of tailings areas within the Opportunity Ponds that have the greatest potential to generate windblown dust. Areas that were sprayed with polymer surfactant coating in 2006 include the C2.3 through C2.7 Cells, B1.2 through B1.9 Cells, and dry, barren portions of the C1.4, C1.5, and northern D2 Cells. The specific methods that will be utilized to apply polymer surfactant to minimize dust in open tailings areas is as follows:

- All open tailings areas with the exception of areas of saturated tailings will receive an initial application of polymer surfactant at a rate of approximately 150 gallons/acre in 2006 and 2007, as weather permits.
- If the initial polymer surfactant coating is no-longer able to provide effective long term dust control, maintenance applications of polymer surfactant will be applied, as necessary to minimize fugitive dust. Maintenance applications of polymer surfactant will be applied at the same rate of approximately 150 gallons/acre unless polymer wear indicates that a higher rate is needed.
- Additional tailings areas that were saturated in 2007 and subsequently dry out due to construction of haul roads or other conditions will receive polymer surfactant as needed until final reclamation is complete.

4.0 SUMMARY

It is expected that continued use of current practices and implementation additional practices outlined in this Dust Management Plan will achieve the dust control objectives outlined in the RDU 8 RAWP/FDR. Objectives will be met through the use of BMPs in active construction areas and the application of other dust control measures in inactive open tailings areas that have potential to generate fugitive dust. Active construction areas primarily include haul roads, borrow areas, and cover installation areas. Each active construction area has been assigned; 1) specific BMPs and dust control processes, 2) triggers that will be used to start or increase implementation of BMPs, and 3) conditions for shutting down operations before dust migrates beyond the point of compliance. If operations must be shut down, the BMPs will be re-evaluated prior to resuming activities to determine what additional BMPs or actions are required to assure that the objectives are met when operations resume.

Inactive areas, including open tailings areas with highest potential to generate fugitive dust, have been targeted to receive final soil cover or temporary surfactant cover under revised project sequencing. The RDU 8 construction sequencing focuses final cover placement over exposed tailings areas in order from highest to lowest dust generating potential. Dust generating tailings areas that are not scheduled to receive final cover installation will receive polymer surfactant cover, which will be maintained on an as needed basis to minimize fugitive dust until final cover is installed. Many of the high potential dust generating areas within the Opportunity Ponds were addressed with final or partial covers or polymer surfactant cover in 2006.

The Monitoring Plan for ambient air quality around the perimeter of the RDU 8 site has been developed by Atlantic Richfield and MDEQ (SST OU) in order to assess fugitive dust, evaluate the effectiveness of BMPs, and allow for implementation of appropriate dust mitigation measures. The two PM-10 samplers that have been installed in proximity to the ongoing remedial activities within RDU 8 will continue to collect routine samples of the ambient air quality every 3 days. If air quality monitoring identifies exceedances of the standards identified, then additional construction and/or dust control BMPs will be evaluated and implemented, as necessary, to minimize dust in the area.

5.0 REFERENCES

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- Liberty Northwest Insurance Corporation, 2003. Industrial Hygiene Report: Aspen Hills & Opportunity Pond A-Cells Reclamation Projects. Portland, OR.
- Tetra Tech, 1987. Anaconda Smelter Remedial Investigation/Feasibility Study. Master Investigation Draft Remedial Investigation Report. Tetra tech, Inc. Bellvue, Washington.

Attachment 3

Job Risk Assessment

Document Control No.: RA-07-3	Date Assessment Completed: 11/12/2010	Location: Yerington Mine Site	<div>Brown AND Caldwell</div>
Job Name: Dust Suppression Work Plan	Job Description: Spray application of "Envirotac II" dust suppressant to the Lined and Unlined Evaporation Ponds for the purpose of controlling wind-born fugitive dust emissions. Liquid dust suppressant with be mixed with water and applied to pond sediments with a spray-behind applicator on a Terragator UTV or through a pressurized spray hose from the Terragator. The Terragator will drive across the accessible pond surfaces. The reported life span of the application is 12 to 24 months.	Risk Assessment Leader: Penny Bassett Risk Assessment Team: WRA Reviewed & Authorized to Proceed: SIMOPS: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Designated PIC: Roe Souther	

Work Plan (List Job Steps) List the jobs required to complete the project scope in the sequence they are carried out.	Any tools or heavy equipment needed? If YES, What Type	Is this a SIMOP? If YES, Include in Mitigation Plan.	Do any of the Golden Rules of Safety apply? If YES, Which of the 8?	Which of the 8 energy or biological root sources could possibly be involved in this job?	What would be the result of exposure to a biological or energy source? (e.g., Bites, Slips, trips, falls, exposures, electrocution, injury, death, etc.); and How, where, or when could an uncontrolled release or unwanted contact with a biological or energy source occur? Note: Humans are biological sources, and their physical abilities, competency, and training should also be considered here.	Environmental Impacts Could there be a release to the air, soil or water, and or, will a waste be generated? If YES, What?	Pre-Mitigation Risk Evaluation				Permit(s) Required? If YES, What kind?	Energy / Biological / Waste Management Plan List control measures required to eliminate, control, or protect against unwanted contact with an uncontrolled biological or energy source to minimize the risk of injury or environmental impact. Hierarchy of Controls: Elimination, Substitution, Isolation, Engineering/ Administrative, PPE	Who is responsible for Hazard Mitigation? Name or Title	Post-Mitigation Risk Evaluation			
							Frequency	Consequence	Likelihood	Risk Score				Frequency	Consequence	Likelihood	Risk Score
General Hazard: Driving - Mine site roads - Public roads in town (low speeds) - Public highways (high speeds)	No	Yes	Yes Driving Safety	Motion Biological	Mine roads: Areas with steep embankments; potential heavy equipment on roads; loss of traction if driving too fast; rock chips on windshield. Town roads: Low speed collision with other drivers or pedestrians; drunk drivers. Highways: High speed collision or loss of control with v. serious consequence; drunk, reckless, or distracted drivers.	No	Occasional Exposure	Very Serious Consequence	Unusual but possible	Substantial Risk	No	*All Driving: No use of cell phone or other distractions while vehicle is moving. Mine roads: Observe mine speed limit of 25 mph; be aware of other activity on site. Town roads: Observe posted speed limit; be aware of pedestrians and other drivers. Highways: Observe posted speed limit; avoid passing on 2-lane hwy's if possible; drive with daytime headlights to be more visible.	All	Occasional Exposure	Important Consequence	Remotely possible	Minimal Risk
General Hazard: Weather - Heat or cold stress (hot summer or cold winter weather) - High wind conditions & dust storms - Rain & electrical storms	No	No	No	Thermal Motion Electrical	Heat/cold stress: Thermal hazard in summer or winter months, workers can become dehydrated, disoriented, less aware of hazards if overheated or too cold. Wet/wind conditions can lower the temperature index and add to cold stress issues. Wind: Wind speeds of 20-40 mph are not uncommon, can blow loose items to strike workers, dust can cause limited visibility or irritants in the eyes. Rain/electrical storm: Lightning strike to person or equipment could cause burn or electrocution; rain can make walking and driving surfaces slippery and contribute to cold stress.	No	Occasional Exposure	Very Serious Consequence	Unusual but possible	Substantial Risk	No	Heat/cold Stress: Maintain enough water at the work site to keep workers hydrated; provide shade or protection from wind and weather when possible; monitor worker condition for signs of heat or cold stress. Wind: Tie down or contain loose items on windy days; shut down operations if winds become severe. Rain/electrical storm: Use common sense if lightning storm occurs, STOP WORK if situation warrants but not mandatory for all visual occurrence of lightning as would be for working around raised mast of drill rig; be aware of slippery surfaces and put down materials to create traction if possible.	All	Occasional Exposure	Important Consequence	Remotely possible	Minimal Risk
Mobilize equipment to site and unload. - Unload Terragator and spray equipment - Unload totes of Envirotac using forklift - Water tanker truck	Yes Truck/trailer Fork truck Water truck	No	Yes Driving Safety	Motion Gravity Chemical	Motion - During loading/unloading of equipment, operator could be struck by or caught between equipment and transport truck or ground. Transport of equipment on highway could be subject to vehicle collision or loss of control. Forklift could strike workers on ground or could tip over if operated with load high or on steep slopes or lifting too heavy a load. Gravity - Operator could fall from flatbed truck or equipment. Chemical - Potential contact with Envirotac dust suppressent if spilled from totes.	No	Occasional Exposure	Serious Consequence	Unusual but possible	Low Risk	No	Motion: Use spotter as needed when loading/unloading from transport trailer; select unloading area free of obstructions or other hazards; wear gloves when tightening/loosening tie-down chains. Only trained and competent operator allowed on forklift, follow safe operating instructions, select flat level ground for unloading totes. Gravity: Use 3-pt contact when getting on/off equipment or trailer; pay attention to footing and tripping hazards. Chemical - Review MSDS with workers, have on-hand at work site, wear neoprene or nitrile gloves when handling tanks.	EP&A Operator	Occasional Exposure	Important Consequence	Remotely possible	Minimal Risk
Mix Envirotac with water in applicator tank (to be done at pond area on accessible embankments or roadways) - Fill water truck from water supply source - Pump water into applicator tank from water truck - Add Envirotac to water in applicator tank and allow to self mix	Yes Terragator Spray tank Water truck Pump	Yes	No	Chemical Motion Gravity	Chemical - Potential contact with Envirotac dust suppressent, according to MSDS there is low hazard if contact with chemical. Envirotac is an acrylic polymer with an HMIS rating of HEALTH=1, FLAM=0, REACTIVE=0. Potential for spray or splash of water or Envirotac from pump or hose during transfer. Motion/gravity - Climbing on water truck, trailer or tote for access during mixing has potential for slip or fall. Filling and driving water truck to mixing area, could strike ground workers, collision with other vehicles, loss of control on mine roads or near steep pond embankments. Electrical - Electrical shock from generator, electrical cords, or pump if they are damaged.	Yes Spill of Envirotac would have little environmental impact	Frequent Exposure	Serious Consequence	Unusual but possible	Substantial Risk	No	Chemical - Review MSDS with workers, have on-hand at work site, wear neoprene or nitrile gloves and safety glasses when handling tanks, operating pumps, transferring liquid. No other extra PPE is required. Motion/gravity - Review hazards of climbing on equipment with workers during toolbox meeting and select appropriate access points to minimize climbing on equipment. Observe site driving reqmts (speed limit, no cell phone). Use a spotter when backing equipment near obstacles such as pond embankments, work areas. Electrical - Inspect all electrical equipment daily or prior to operation to ensure electrical cords and connections are in good shape. Take out of service or repair if damage is observed.	EP&A Operator	Frequent Exposure	Important Consequence	Remotely possible	Minimal Risk
Terragator application to Unlined Evaporation Pond sediments Sediments are expected to be moist to dry (unsaturated) with no standing water, several areas with rough pitted terrain from wind erosion, most areas should be accessible by Terragator. - Spray bar application while driving - Spray hose application to inaccessible areas	Yes Terragator	Yes	No	Motion Gravity Chemical	Motion/gravity - Use of UTV Terragator driving on pond sediments, potential to overturn UTV in areas of rough terrain/steep slopes, get stuck in soft sediments. Chemical - Contact with diluted Envirotac during application, splash or spray from applicator or hose, low hazard with no significant health affects from contact. Contact with pond sediments high in metal content, inhalation hazard if significant dust is generated.	No	Continuous Exposure	Very Serious Consequence	Unusual but possible	Very High Risk	No	Motion/gravity - Only trained/competent operators allowed on Terragator. Use of wide floatation tires will minimize potential to get stuck in soft sediments. Seatbelts and roll cage required. Scout out driving area on foot if uncertain about accessibility. Chemical - Wear safety glasses and work gloves or neoprene/nitrile gloves when applying. Establish a dust action level and monitor real-time dust levels during application, wear fitted respirators if action level is exceeded.	EP&A Operator	Continuous Exposure	Important Consequence	Remotely possible	Low Risk
Terragator application to Lined Evaporation Pond Central portions of pond remain saturated and inaccessible year-round, standing water or pore water in these areas is strongly acidic (pH < 1). Perimeter areas have thin sediments that can be moist to dry and are accessible to walk/drive on. - Spray bar application while driving - Spray hose application to inaccessible areas	Yes Terragator	Yes	No	Chemical Motion Gravity	Chemical - Contact with low pH standing water can cause acid burns to skin or eyes, water and saturated sediments should be considered highly hazardous. Motion/gravity - Same as above.	No	Continuous Exposure	Very Serious Consequence	Quite Possible	Very High Risk	No	Chemical - Avoid walking or driving in areas of saturated sediments or ponded water. Workers should carry an eyewash bottle with them at all times when working in this pond and a portable shower/eyewash station should be set up on embankment. Use buddy system at all times when working in this pond. Motion/gravity - Same as above.	EP&A Operator	Frequent Exposure	Serious Consequence	Conceivable but unlikely	Low Risk
Decontamination of Terragator - Installation of rumble strips and/or wash pad/liner - Pressure washing of Terragator - Wash water will be allowed to flow back into evap ponds	Yes Pressure washer	Yes	No	Pressure Chemical	Pressure - High pressure water jet can break or bruise skin or damage eyes if directed at a person. Chemical - Mud being sprayed off equipment will consist of pond sediments and may have elevated concentrations of metals or may be low pH (acidic). Contact with decon solutions could result in minor skin irritation.	Yes Decon solutions could spill to soil	Unusual Exposure	Very Serious Consequence	Unusual but possible	Substantial Risk	No	Pressure - only trained and competent operators allowed to use pressure washer. Do not point it directly at a person, wear safety glasses and face shield, inspect hoses for damage prior to each use. Chemical - Place equipment on liner material to contain decon water and allow it to flow or pump into the Lined or Unlined Evap Pond. Wear neoprene, nitrile or work gloves and avoid direct contact with decon water and mud.	EP&A Operator	Unusual Exposure	Important Consequence	Conceivable but unlikely	Minimal Risk

Environmental Products & Applications, Inc..

Master Code of Safe Practices

Job Safety Handbook

Prepared and presented
By



ENVIRONMENTAL PRODUCTS & APPLICATIONS, INC., INC.

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**ENVIRONMENTAL PRODUCTS & APPLICATIONS,
INC., INC.**

Injury and Illness Prevention

10/16/97

Cal/OSHA Standards *California Code of Regulations, Title 8*



Policy

It is our goal to provide a safe and healthy workplace for all employees and to avoid occupational injuries and illness. The priority of workplace safety and health is of such importance that it will be placed above operating efficiency and productivity whenever necessary.

To attain this goal, an injury and illness prevention program is adopted in compliance with Labor Code Section 6401.7, General Industry Safety Order Section 3203, and other applicable local, state, and federal laws. The program includes training and instruction concerning safe and healthy work practices applicable to the job, as well as systems for investigating work-related injuries and illness, identifying and rating workplace hazards, and correcting unsafe work conditions.

To be successful, the program requires cooperation in all safety and health matters, not only between supervisor and employee, but also between each employee and his or her coworker. It is the responsibility of every employee to always follow the requirements of the injury and illness prevention program. **This requirement is a condition of your employment.**

Employees who fail to follow job safety and health standards are subject to disciplinary action, including, but not limited to: verbal reprimands, written warnings, suspension, or immediate discharge. The degree of discipline in any particular instance will be at the sole discretion of the management. Nothing in our injury and illness prevention program, however, shall alter the right of any employee or the employer to end employment whenever, with or without cause or notice.

Safety Disciplinary Guidelines

The safety of our workforce is the number one priority at our Company. We expect each and every employee to take safety seriously and obey all safety rules and safe work practices. All employees are empowered to stop any act or action, which would pose a safety risk to them or to the safety of employee.

Our Company will take disciplinary action against any employee who violates our safety rules, works in an unsafe manner, or deliberately circumvents any safety devices, policy or procedure in any way. We separate safety violations into two categories, major or flagrant and minor.

MAJOR VIOLATION

Major violations are purposely or knowingly performing an act that places you or another employee at serious risk. Such an act may include the disarming of a safety switch, guard, tag, or alarm, or operating equipment that has been locked-out or tagged-out, or failing to lock-out or tag-out a piece of equipment that Maintenance has removed from service. Operating or performing any task that you have not been trained for and for which you have not been granted permission or authority to perform. This also will include the operation of any machine or processes in an unsafe manner in which the employee has been trained and knows better.

MINOR VIOLATION

Minor violations are those that are considered by management to not pose an immediate risk or that has resulted from a lack of training or experience. Examples include not wearing proper safety gear such as back braces, eyeglasses, earplugs, etc. or leaving a file drawer open. Also included in minor violations would be new employee actions until the employee has received proper training.

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Disciplinary Process is as follows:

Type	Violation	Discipline
Major/Flagrant Violation	First	Written notice to correct that can include up to 2-days suspension without pay
	Second	Written notice that will include either a suspension of up to five days or termination
	Third	Termination of employment
Minor Violation	First thru Third	Oral warning
	Fourth	Written notice that can include up to 2-day suspension
	Fifth	Written notice that will include a suspension up to three days
	Sixth	Written notice to include a suspension of two to five days or termination
	Seventh	Termination of employment

Reporting Work Related Injuries and Illness

9/3/96



All work-related injuries and illnesses, regardless of their type or seriousness, must be reported to management **IMMEDIATELY**.

If you are injured or become ill because of your job, you are entitled to workers' compensation benefits, if applicable, because of the extent of the injury or illness. Except for minor "first aid only" injuries, you must immediately complete

the "Employee" section of an EMPLOYEE'S CLAIM FOR WORKERS' COMPENSATION BENEFITS (DWC Form 1), and give the form to your employer. You will keep the copy marked "Employee's Temporary Receipt" until you receive the dated copy from your employer. You may contact the California Office of Benefit

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Assistance and Enforcement at 1-800-736-7401 if you need help filling out the form or receiving your benefits. An explanation of workers' compensation benefits is included on the reverse side of the form.

NOTE: Employees who report work-related injuries and illnesses are protected by law, and may do so without fear of reprisal.

NOTE: In accordance with Senate Bill # 1218 (SB-1218), employees who report or file a false workers' compensation claim can be subject to felony charges, punishable by up to five (5) years in state prison and a \$50,000. Fine.

Remember that you may report unsafe conditions without fear by calling

1-800-73-HELP-4

First Aid and Medical Attention

9/3/96

Policy



Proper treatment must be obtained for all injuries and illnesses, no matter how slight they may be:

Basic first aid is ordinarily adequate treatment for minor cuts, abrasions, and similar injuries; more comprehensive emergency medical attention must be obtained in the case of more serious injuries or illnesses. The following actions will be taken as required, by the extent of the injury:

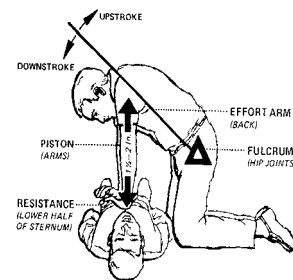
Guidelines

First aid will be given if needed to control bleeding or prevent further injury. Persons who have broken bones will not be moved, unless deemed necessary. If the victim is in contact with a live electric current, the electricity must be turned off before rescue contact is made.

The proper emergency personnel (fire department, ambulance, etc.) **must be told immediately** if on-site medical attention, or transport to an emergency hospital, is required due to the seriousness of the injury.

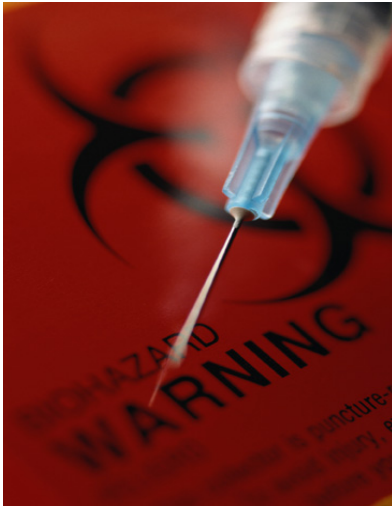
If, because of the lesser degree of injury, emergency personnel are not needed for transportation, the injured will be transported for treatment to an approved licensed medical professional or facility, approved by management.

If a toxic or hazardous material meets the body, the correct treatment for that substance must be given in accordance to the Material Safety Data Sheet, (MSDS). While flushing with water normally treats injury to the eyes or skin caused by chemical contact, there may be exceptions. MSDS instructions and professional medical advice will be followed.



Blood borne Pathogens

Education and Training Plan



Following the proper procedure can keep you safe from infectious diseases such as AIDS and Hepatitis B. Be sure that you take the necessary precautions in these important areas. Many of you have exposure to blood borne pathogens and are not aware of this danger. For example: If you clean the rest rooms, are responsible for First Aid, or if you are injured or hurt, you could be in danger. Maybe one of your customer's is infected, and you are required to repair that customer's equipment, facilities, or provide personal service. Although your exposure is minimal, we want you to take the necessary precautions to avoid exposure. First, let's define some terms.

Definitions

“Blood borne Pathogens” means pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

“Blood” means human blood, human blood components, and products made from human blood.

“HBV” means hepatitis B virus.

“HIV” means human immunodeficiency virus.

“Occupational Exposure” means reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.

“Parenteral” means piercing mucous membranes or the skin barrier through such events as needle sticks, human bites, cuts, and abrasions.



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“Source Individual” means any individual, living or dead, whose blood or other potentially infectious materials may be a source of occupational exposure to the employee.

“Exposure Incident” means a specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that result from the performance of an employee’s duties.

“Other Potentially Infectious Materials” means:

The following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood such as saliva or vomitus, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids, such as in an emergency response situation.



Any unfixed tissue or organ (other than intact skin) from a human (living or dead); and HIV-containing cell or tissue culture, organ culture, and HIV- or HBV-containing culture medium or other solutions and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

“Personal Protective Equipment” is specialized clothing or equipment worn or used by an employee for protection against a hazard.

“Universal precautions” is an approach to infection control. According to the concept of Universal Precautions, all human blood and certain human fluids are treated as if known to be infectious for HIV, HBV and other Bloodborne pathogens.



“Work Practice Controls” means controls that reduce the likelihood of exposure, or alter the manner in which a task is performed.

Exposure

With these definitions in mind, let’s take a moment to think about the jobs that may have some exposure in your work place. We have made a list of the more obvious jobs.

Please add to this list, and return the additional jobs and job descriptions that you believe have exposure, to your Safety Person so we can add them to the list.

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The following jobs may have an exposure to blood borne pathogens.

Janitors

Nurses

Doctors

Dental Technicians

Dentists

Lab Technicians

First Aid Persons

Maids

Maintenance Personnel

Plumbers

Helpers

Apprentices

Also, any task not listed above, if blood or other body fluids are, or may be, present.

Employees who do any of the following tasks may be exposed:

Drain cleaning

Clearing stoppages

Changing the following items:

Sinks

Traps

Toilets

Bath Tubs

Showers

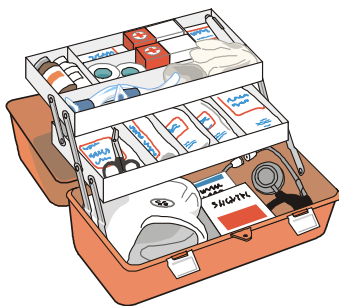
Shower pans

Employees exposed to the blood or body fluids of fellow employees

If you help a fellow employee who is bleeding, or if you are exposed to their body fluids

As you may have guessed, this is most of us! Most of us will never encounter the kind of hazard that the OSHA law was intended to cover, but because the law does not rule out minor exposure, we will need to train and educate you and your fellow employees.

How To Keep Yourself Safe



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First and foremost, use “Universal Precautions”. All blood and body fluids will be treated as being infected.

Whenever you do a job or task that may expose you to Bloodborne pathogens, you must wear protective equipment. That includes:

A full-face shield to protect your mouth, eyes and nose.

Protective gloves for your hands.

If you have cuts or any broken skin, the appropriate cover or protection.

If you have a barrier cream, it is very important to protect your hands under the protective gloves.

Avoid all actions and tools that may cause a personal injury.

Great care must be used in avoiding sharp or jagged objects.

Wash your hands and face after completing the assigned task.

Understand that ***you must wash your hands*** with soap after removing gloves or other protective equipment.

If any exposure is suspected, wash your hands and any other affected skin area with soap and water, or flush affected mucous membranes with water immediately.

Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in work areas where there is a reasonable likelihood of occupational exposure.

What To Do If Exposed



Get first aid. Wash the exposed area, and your face, and hands if possible.

TELL YOUR EMPLOYER. You must report any exposure incident, just as you would any other accident or illness.

Get medical attention. Make sure that you check with your approved Workers Compensation doctor, so the proper medical treatment will be provided.

You must complete an incident report and a report of injury or illness. Remember to be as detailed as you can. We will use these reports to

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find out what happened and how to keep the problem from happening again. The blank reports are available from your employer.

Medical Information



The employer shall make available the hepatitis B vaccine and vaccination series to all employees who have occupational exposure. The employer will also provide post-exposure evaluation and follow-up to all employees who have had an exposure incident.

Training

All employees, who have or may have occupational exposure, will be trained.

Review of the exposure plan and refresher training must be done on a yearly basis.

Security

2/18/02

Suspicious Persons



To safeguard the premises and the welfare of employees, you will be alert to persons whose presence is of a suspicious nature. If you have doubts about the intentions of any person on the premises, quietly tell your supervisor, and follow other established security procedures. All visitors must have a company escort. Failure to question a non-escorted visitor is a safety violation.

Keys

Keys to the premises, buildings, offices, your work area or storage units must be kept where they are always securely in your possession; they will not be loaned to others or duplicated. If any of the keys in your control are lost or stolen you must immediately report this to your supervisor.

WORKPLACE VIOLENCE POLICY



In order to assure the continued safety of our employees and customers, Employee Employer Assistance Programs, Inc. will implement the following Workplace Violence Policy effective September 11, 2007. It is of highest importance that all employees read, understand and comply with this policy so that we may prevent workplace violence or effectively respond to it, should it occur.

The constant news reports of violence in the workplace and in our society, compels our company to develop guidelines to help prevent violent occurrences in our facility/facilities. These guidelines are for the protection of our employees, customers and families. We, as a company, may not be able to stop the violence that occurs in our society, but we must work very hard to keep violence out of our workplace. Many experts feel that employees or customers resort to violence when they feel that they are unable to speak with management about their workplace concerns. Violence may also result because an individual has threatened violence in the past, and feels that he or she must resort to violence to save face. All Employee Employer Assistance Programs, Inc. employees have the ability to communicate their concerns regarding their employment or workplace conditions to the management of Employee Employer Assistance Programs, Inc..

If an employee feels uncomfortable discussing his/her concerns with management or their supervisor, they may call the 800 anonymous telephone number, to express their concerns.

While we want everyone to feel free to express himself or herself, we want to make clear a few critical policies:

There will be zero tolerance for threats of physical or emotional violence in the workplace, including threats or acts ranging from fistfights to gunplay. The policy extends to jokes, jests and horseplay, or any act of intimidation, whether the act is intended to be taken seriously, or just intended as a jest or a joke.

Any threat, remark, joke or jest will be taken seriously. All articulated threats would be presumed to constitute a statement of an employee's intent to do physical harm to others or to property.

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Any articulated threat or act of violence in the workplace may result in immediate discipline up to and including termination. Remember we have a “**zero**” tolerance for this kind of behavior, whether serious or in jest.

Every employee has the obligation to immediately report any threat or security hazard against any employee. Failure to do so may result in disciplinary action up to and including termination. The potential loss of life or property far outweighs the obligation to preserve any confidence and transcends any friendship.

Identifying Hazards

Sources of Workplace Violence

Workplace violence can arise from many sources. The most common types of workplace violence are:

TYPE I VIOLENCE

The perpetrator of the violence is a person with no legitimate relationship to the workplace or victim and enters the workplace to commit a robbery, random violent act, or other criminal acts.

TYPE II VIOLENCE

Involves a violent act by an individual who is the recipient of a service provided by the workplace or victim (i.e. the perpetrator is a disgruntled customer).

TYPE III VIOLENCE

The perpetrator has an employment related relationship with the employer or its employees (i.e. the perpetrator is (a) current or former employee, supervisor, or manager; (b) current or former friend, spouse, lover, or relative of an employee; (c) some other individual who has a dispute with the employee or employer).

You should be aware of the potential sources of workplace violence so that you do not accidentally dismiss a dangerous threat, act, or situation that, under other conditions would alert you to a serious hazard.

Employee Employer Assistance Programs, Inc., like most employers, is not immune to workplace violence. For that reason, it is extremely important that any verbal threats, threatening conduct, or other workplace security hazards be reported to your supervisor immediately. If your supervisor or manager is unavailable, you should report the threat or hazard to Thomas C. Carlisle or in their absence, to a senior manager. In no instance

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should threatening words or conduct from any source be ignored or dismissed. Failure to report violations of this policy may result in disciplinary action. If you do not feel comfortable in reporting a hazard to your supervisor or manager you may report the condition anonymously to the following telephone number:

1-800-734-3574

Remember the only silly report is the one not made

Sources of Security Hazards

General Information on Security Hazards

It is important for all employees to be aware of their work areas. Under current state law you are to know the procedures and plans of your employer to help you exit the workplace in an emergency. This plan is called ***“The Emergency Action Plan”***. This plan should be posted in your work area. The Plan will contain the escape route and the assigned meeting place. If you are required to evacuate the workplace, you are also required to go to the meeting place and report in. In order to assure that you are prepared, you should be able to access and exit your workstation with ease, and you should know where all exits are, as well as what your escape route is.

Your safety as well as the safety of your co-workers, is dependent on your being aware of your work area and the safety and security devices and their operation.

Management will repair and maintain these following devices to the best of their ability, however you are required to inform management if these devices are not working properly. You must notify your supervisor of any broken, damaged or otherwise inadequate:

Security alarms

Restraint systems

Physical barriers

Panic buttons

Locks

Doors

Any obstacle to you, your escape route, which may impede the operation of the security equipment or systems.

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An Emergency Action Plan is incorporated for your information with this handbook.

Every employee will receive a copy of the workplace violence policy and procedure. Every employee will read and sign this policy confirming their commitment to following and supporting this policy.

Workplace Behavior

At Employee Employer Assistance Programs, Inc., we expect every employee to be a supportive and enthusiastic member of the team. We all help and support each other. We care how each employee feels and want everyone to participate in the workplace. We expect each employee to add to the sense of security and well being of our workplace.

To foster a warm and healthy atmosphere we are reaffirming our open door policy. Anyone may speak with any supervisor or manager concerning any problem.

Under no circumstances is any employee to engage in verbal or physical threats or actions, which may cause another employee, or person to feel threatened, afraid, or to create a security hazard in the workplace:

Verbal threats or actions, which may cause a security hazard, include:

Swearing

Cussing

Lewd gesturing

Making offensive remarks

Direct or veiled threats

Harassing phone calls

Shouting

Disregard for the safety of other employees

Throwing anything

Kicking any object

Slamming doors

Displaying weapons of any kind

Having concealed weapons on their person or in their personal effects. (Except when required by their employment duties; all weapons must be licensed and permitted, where required.)

Any other action which could reasonably be interpreted as done for the purpose of inciting or insulting a co-worker, supervisor, customer or any person.

Any act, which may cause another employee to feel threatened or intimidated.

Each employee is responsible for his or her own actions. Any employee who has knowledge of another employee engaging in verbal or physical threats or conduct, which may cause a security hazard, should report such threats or conduct to their supervisor or, if their supervisor is unavailable, to the Personnel Director. If this is not possible, or if you feel that reporting a security hazard may put you at risk you may call the 800 number listed below to report any unsafe action or condition.

1-800-734-3574

Responding To Threats or Security Hazards

If you are **confronted with immediate or imminent violence** and you fear for your safety, sound all security alarms available and CALL 911.

Call your Supervisor or Management,
then call 1-800-734-3574.

If you see that **immediate or imminent violence is about** to occur to a co-worker, sound all security alarms available and call 911.

Call your Supervisor or Management,
then call 1-800-734-3574.

When the threat or hazard is not imminent, the following items will guide you in what and how to proceed. Your Supervisor or Management or counselors will perform many of these items.

- All threats or security hazards will be treated as factual until proven otherwise.
- All threats and security hazards will be reported to your supervisor or appropriate personnel at once. If you do not feel comfortable you may call:
- 1-800-734-3574
- Do whatever is necessary to prevent harm to yourself and your coworkers.
- Secure the hazard area, until repairs either temporary or permanent, can be completed.
- Collect information regarding exactly what happened and what was said.
- Summon emergency service if necessary.
- Evacuate the building if necessary.
- If possibility of violence is assessed, involve legal, human resources, and security.

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- Notify the authorities if a criminal act is suspected or appears to be imminent.
- Verify procedures and actions taken or contemplated with a supervisor.
- Discipline an employee under your supervision if they seem determined to present a security risk to the company, its employees, or its customers.
- Post-event crisis debriefing or trauma counseling, will be provided if requested by an employee under your supervision.
- Promptly investigate all reports of security hazards or threats in the area that you are responsible for.
- Request legal restraints where warranted.
- Train all personnel, under your supervision, in what to look for.
- In response to common threats and security hazards. Assign tasks, duties and responsibilities for employees under your supervision.

Please Note

Any person or employee making an articulated threat of violence may result in the investigation of their background, criminal history, weapons ownership, traffic citations and police reports. A search of the employee's locker, desk, work area, automobile, purse, bag, containers or personal effects may be undertaken. No one who articulates a threat or poses a security hazard should expect to maintain privacy in those areas that need to be investigated so that we can ensure the safety of our workplace, customers and employees. Your area, personal area, desk, locker, file cabinet or other storage areas may be searched at-will. Do not bring anything to work that you do not want known or seen by others. You are not provided with a secure storage for any item or information, personal or business.

Procedure For Reporting Workplace Violence

A. Reporting Of Threats Or Security Hazards

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In the event that any employee is the subject of, or has knowledge of, a threat or security hazard, the employee should **immediately** report the threat or hazard to his or her supervisor, the personnel director, or a Supervisor or Management member. If none of the above is available, report the conduct directly to the President.

1. Report threats or security hazards without fear of reprisal.

No reprisal will be taken against you for reporting any workplace hazard, regardless of the legitimacy of the hazard or its source.

1-800-734-3574

2. Report threats or security hazards without fear of unreasonable danger.

While all businesses cannot ensure the safety of all of its employees and customers, we will take reasonable action to assure you that employees who report threats or safety hazards are not subject to unreasonable danger. Such action may include disciplining or terminating an employee who has engaged in verbal threats or conduct, implementing security devices or procedures to ensure the safety of the reporting employee or even obtaining a restraining order on behalf of the employee.

3. Every employee has the obligation to immediately report any threat or security hazard against any employee. Failure to do so may result in disciplinary action up to and including termination. The potential loss of life or property far outweighs the obligation to preserve any confidence and transcends any friendship.

We will have a planned response to most of the common types of threats and security hazards. We have legal and psychological support for our policy and procedures. We will not hesitate to use the full weight of the law to protect our employees and customers.

B. When Reporting A Security Threat

Remember the following information will be very helpful in responding to the threat and correcting any hazard. So, take a moment and fill out the following information.

Personal Threats

Who made the threat?

Against whom was the threat made?

State the specific language of the threat.

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Was there any physical conduct by the threatening party, which would tend to substantiate that the individual intends to follow through on the threat?

State the name(s) of any other witnesses to the threat or violent conduct.

State the time and place when and where the threat or violent conduct occurred.

State threats or violent conduct by the alleged perpetrator before this incident.

Record any other information that may help to conduct an investigation, and will help ensure that the threat will not be carried out, or that violent conduct will not occur in the workplace.

Investigation Of Workplace Hazards

All threats and security hazards will be taken seriously and will be investigated and resolved.

Upon receipt of a report of a workplace hazard, Employee Employer Assistance Programs, Inc. shall undertake an investigation. This investigation will be undertaken by an employee, officer of the corporation, or may be undertaken by an outside investigator, including a police officer or federal agent. Your cooperation in this investigation is essential and a condition of your employment. If you have knowledge of any security hazard or threat you should report such to the investigating officer. Again, you may report without fear of reprisal or without fear that you will be placed in unreasonable danger.

Hazard Corrections

Depending upon the circumstances of the hazard, Employee Employer Assistance Programs, Inc. shall take prompt action to correct the hazard. Such action may include, but is not limited to the following:

- Summoning emergency service if necessary.
- Disciplining an employee determined to have presented a security risk to Employee Employer Assistance Programs, Inc., its employees or its customers.
- Fixing or repairing any device that may cause a security hazard by its not functioning properly.
- Post-event crisis debriefing or trauma counseling if requested by an employee.

ENVIRONMENTAL PRODUCTS & APPLICATIONS, INC., INC.

- Investigating all reports of security hazards.
- Providing an anonymous reporting system to ensure all employees feel comfortable reporting security hazards.

Should you believe that the action taken by Employee Employer Assistance Programs, Inc. is inadequate, you should bring your concerns to the attention of E.E.A.P., Inc., so that further corrective action may be taken, if necessary or required.

Prevention Programs

Provide ongoing safety training and education.

Regular detailed safety inspections will be conducted at all locations.

Reporting Unsafe Work Conditions

9/3/96

Employees have the ***OBLIGATION*** and ***RIGHT*** to report unsafe conditions, unrecognized safety hazards, or safety violations of others. If you wish to make a report, it can be made orally to your supervisor or to another member of management. You may submit your concern in writing, either signed or anonymously. An Employee Report of Safety/ Health Hazard form will be used for this purpose. We have also provided a toll free phone line for your use. You may call and report unsafe or unhealthy conditions without fear, when you call remember to tell us the location of the problem, what is wrong and if you can, how to fix the problem. You may want to take a moment and write down your thoughts before you call. We are more concerned with what needs to be corrected, not who is reporting the problem. The Health and Safety program will not be successful without your input and help. Employees who report unsafe work conditions or practices are protected by law and may do so without fear of reprisal. All reports will be considered signed or not.

**Call 1-800-73-HELP-4
To Report Hazards or unsafe
conditions**

Emergency Action Plan

11/28/99

Policy

An emergency action plan has been developed to establish the actions that must be taken to ensure your safety from fire and other emergencies.

Procedures

The below information is posted in each work area. All employees have the *responsibility* to make themselves familiar with the procedures applicable to *their workstation*.

1. Emergency escape procedures and emergency route assignments.
2. Procedures to be followed by employees who remain to perform critical operations before they evacuate.
3. A procedure to account for all employees after emergency evacuation has been completed.
4. Rescue and medical duties for employees who are to perform them.
5. The preferred means of reporting fires and other emergencies.
6. Names or job titles of persons or departments who can be contacted for further information or explanation of duties under the plan.

Fire Prevention

9/11/2007



Policy

All employees that are not assigned special duties during a fire are to evacuate the building and assemble at the assigned meeting place if the fire alarm is sounded. If at any time you observe any indications of a fire or a potential fire you must alert your supervisor. If you observe a fire you are to sound the alarm and alert all people in your area, then evacuate.

Safe Practices

NO SMOKING is allowed in areas involving the storage or use of hazardous, flammable, or combustible materials.

Fire extinguishers must be used as directed by the manufacturer's instructions. Standard classes are:



Class A - Ordinary combustible material fires
Class B - Flammable liquid, gas or grease fires
Class C - Energized-electrical equipment fires

Fire doors and shutters must be unobstructed.

Proper clearance must be maintained below sprinkler heads. When exposed to physical damage, metal guards must protect sprinkler heads.

Combustible scrap, debris, and waste must be stored safely and removed from the work site promptly. Covered metal waste cans must be used for oily and paint-soaked waste.

Accumulations of combustible dust must be routinely removed from elevated surfaces.

Flammable liquids must be kept in closed, fire-resistant containers when not in use, or until removed from the work site.

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All spills of flammable or combustible liquids must be cleaned up promptly.

Vacuuming will be used whenever possible rather than blowing or sweeping combustible dust.

Vacuum systems provided to prevent combustible dust from going into suspension must be operated whenever dust is produced.

Metallic or conductive dust must be prevented from entering or collecting on or around electrical enclosures or equipment.

Firm separators will be placed between containers of combustible or flammable material, when stacked one upon another, to assure their support and stability.

While in storage, fuel gas cylinders and oxygen cylinders will be separated by distance or by fire resistant barriers.

All connections on drums and combustible liquid or vapor piping must be tight.

Bulk drums of flammable liquids must be grounded and bonded to containers during dispensing..

FIRE FIGHTING ORGANIZATIONS - TRAINING AND DRILLING

1. Fire fighting organizations shall be provided to assure adequate protection to life and property. NFPA recommendations shall be used for determining type, size, and training of fire fighting organizations.
2. Fire brigade drills shall be held to assure a well-trained and efficient operating force. Records of such drills shall be maintained at the installation.
3. Demonstration and training in first aid fire fighting shall be conducted at intervals to insure that project personnel are familiar with, and capable of operating, fire fighting equipment.

Hazardous Materials

9/3/96

Asbestos Policy



The problems with asbestos that face every industry and home are of serious proportions. The whole asbestos question is becoming one of the greatest liability problems we will face for years to come. Handling this material is, and does, pose a serious health problem for everyone. Due to this concern for you and your health the following policy has been adopted.

None of our employees are to handle asbestos at all; except for the employees that have been trained and certified for asbestos work. If you see, or think you see asbestos report the finding to your supervisor.

Program

Governmental regulations require that you have one easy reference for important information about hazardous substances in the workplace. These regulations are covered in the Hazard Communication Plan and the Requirements of Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). This information is contained on labels and in a Material Safety Data Sheet (MSDS) for each such substance in your workplace. You may also receive a copy of the list of chemicals known to the state to cause cancer or reproductive toxicity. It is Company Policy that every material that is carried or stored must be labeled with the name of the material; including water. Any material that is found that is not labeled will be removed and the employee will be in violation of company safety policy. The labels will have the following information provided, if there is room, and may include:

The name of the substance and the name, address, and emergency telephone number of its manufacturer.

Type of protective equipment and safe work practices that are used and followed when working with the substance.

You must review the MSDS before starting any job using a hazardous material, about which you are not familiar, when you have been informed that the MSDS has been changed, or every 30 days. This is to ensure that you are informed and understand just what the material or substance will or can do to you or others. Read labels and the

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MSDS carefully, follow warnings and instructions, use the correct protective clothing and equipment when directed, learn emergency procedures, and practice safe work habits. If you have questions about a hazardous material, ask your supervisor. Failure to follow the requirements of an MSDS may result in disciplinary action, including immediate discharge.

This description of the hazard communications standards is a summary only. Full details, including a list of the hazardous materials used in this organization, are contained in the official Hazard Communications Program; you can get a copy from Thomas C. Carlisle. All MSDS information can be seen at the office, or ask Thomas C. Carlisle.

Remember that the following information is contained on the MSDS sheet. Read and study the information on the chemicals and items that you use in your work. Although the layout of MSDS sheets vary, you will always find the following information on the sheets.

MSDS Information

How to read an MSDS

Section I: Name, manufacturer, preparation date, and emergency contact, with telephone number.

Section II: Identifies potentially hazardous ingredients. Product identity matches the label, Chemical Abstract Number (CAS) for each ingredient, percent limit, Permissible Exposure Limit (PEL) and short Term Exposure Limit (STEL) in the air.

Section III: Describes what the material looks or smells like and its physical characteristics.

Section IV: Describes the flash or ignition point of the material and describes how to put out any fire containing the material as well as potential explosion hazard and potential reactivity.

Section V: Identifies symptoms of overexposure, health effects or risks, first aid emergency procedures, suspected cancer causing agents and medical conditions aggravated by exposure.

Section VI: What the material will do under certain conditions, how stable the material is and the product incompatibility with other materials.

Section VII: Describes what to do in case of a spill or leak and how to properly dispose of the material and any clean up agents used.

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Section VIII: Informs the users of control procedures or measures, such as ventilation and personal protection equipment, (i.e., gloves, respirators, eye shields) for protection when using the material.

Section IX: Describes special handling and storage precautions to be taken with the material and what protective measures need to be followed during the maintenance or removal of contaminated equipment or materials.

Section X: Provides other information about the material not mentioned in one of the above sections. This is the section that will inform you if this process or material is covered under Prop. 65.

You may find it very useful to find an MSDS and follow this guide while you read the various sections. Again, if you need help understanding this information, ask your supervisor or group leader.

Proposition 65 Warning

WARNING:

This area contains chemicals known to the State of California to
cause cancer, birth defects or other reproductive harm.

This warning is intended for the areas that smoking is permitted.

WARNING:

This area contains cigarette smoke known to the State of California
to cause cancer, birth defects or other reproductive harm.

(This warning required by Section 25249.6 of the California Health
and Safety Code)

General Safety Rules

9/3/96

Policy

A good safety record is the result of safe working conditions combined with alertness to common sense safe and healthy work practices. All Federal, State, County and City codes, laws, and ordinances will always be followed. We are a law-abiding business. Compliance with the following general safety rules is important to accident prevention:

Safe Practices

Sound judgment and safe practices will be used in the work habits of all employees.

No person shall knowingly be allowed on the job with illegal drugs in his/her system, or if his/her ability to safely perform the assigned task is *impaired by alcohol, drugs, prescription drugs or over the counter medications*.

You can call the following Organizations for help!!

Alcoholics Anonymous (AA)
National Council on Alcoholism
National Institute on Drug Abuse
National Institute on Drug Abuse (Spanish)
Cocaine Hotline
Cocaine Anonymous (CA)

(Or, you can call the information operator, and ask for help in your local area.)

Employee Employer Assistance Programs, Inc. also has people who can help with drug and alcohol problems. They will be glad to help put you in contact with someone who can help you find an answer. Call: **(800) 734-3574**.

Personal safety protection equipment must be used as required by management.

Equipment is only to be operated by those authorized as a result of their knowledge, training and experience. You must have the permission of management before you operate equipment.

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Guards and safety devices installed over a point of operation, moving parts, or electrical connections, must always be in place. Removing a guard without management's permission is grounds for dismissal.

Fire protection and prevention practices, including the clearance of passage aisles and doorways, proper storage of flammable materials, and control of smoking and open flames, must be followed.

In addition to the general rules listed above and the practices listed in this Job Safety Handbook, other more detailed safe and healthy work practices may apply to your job. If so, you must know and follow them carefully. All employees must follow all laws, rules, and regulations concerning safe and healthy work practices as published by governmental agencies, having jurisdiction over such matters.

General Office

9/3/96

Policy

Working in an office is both demanding, and at times, can be dangerous. Many times we think that the office area is safe and not like working in a factory, garage or other manufacturing area. But many times the accident rate is greater in the office than in the warehouse. Think of your job as a process. We want to encourage you to think of your office job as processes for handling the paper workload. Safety is the first principle of good office moral. Take a moment and look around you. How can we make our office the safest and most productive office? The following rules can give you a guide to helping make your area safe for you.

Safe Practices

All carpeting will be flat and smooth.

All worn or rough areas of carpeting will be fixed or covered.

Electrical wires must not be put under chair mats. The pressure and movement of the chair can cause the wire to wear through and shock the person sitting in the chair.

All extension cords must be three (3) wires. This is the type with three (3) prongs on the plug end.

Trip and fall hazards are very common in the office environment; keep your eyes open.

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Do not hang a cord from your desk into an aisle or walkway; this will create a tripping hazard.

All chairs will be inspected daily for broken or missing legs or components.

All chairs will be used with all of the legs on the ground.

You may not recline in any chair or stool that is not designed specifically for that function.

You will not use a chair or stool in place of a step stool or ladder.

Loud music will not be tolerated in the workplace.

You will not sit on counters, desktops or any surface that is not intended to be used as a seat.

Care will be taken when lifting any heavy object. A heavy object is defined as weighing more than 25 pounds. Remember that objects, which may not be heavy, can be bulky. If you have any doubt about your ability to lift or carry an object, get help.

Practical jokes will not be tolerated. What you think is funny may hurt someone.

Personal jewelry must not pose a safety hazard. Earrings that put strain on earlobes or interfere with phone use should not be worn. Rings and bracelets that can get caught or tangled in equipment are prohibited.

General Work Environment

1/14/02

Policy

We believe that all safety begins with common sense and good judgment. The first and most basic rule of safety is respect for yourself and your coworker(s). Take a moment and think how your actions will affect others. What will be the result of your action or lack of action? When you see a condition or circumstance, that is not as you think it should be, tell someone, do something. Take responsibility for yourself and your area. With this in mind, think about the following rules, and how the rules can help keep you safe.

Safe Practices

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- All work areas must be kept clean and orderly.

- When meals are eaten on the premises, they must be eaten in areas where there is no exposure to toxic materials or other health hazards. You may not eat in areas that have or use toxic or hazardous materials or chemicals. The law also states that you may not eat in bathrooms or restrooms.

- All spilled materials or liquids must be cleaned up immediately. Work surfaces must be kept dry or appropriate means must be taken to assure that surfaces are slip-resistant. If you cannot clean up a spill or other slippery conditions, put a warning sign on the spot and inform your supervisor.

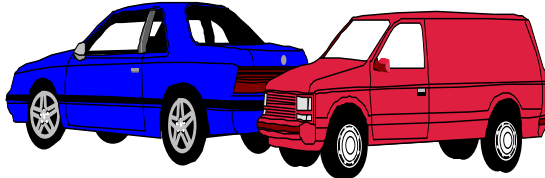
- Waste, scrap, and debris must be stored safely and removed from the work site regularly. Put all of this material in the designated area. (Do not leave any of this material in your work area.)

- Toilets and washing facilities must be kept clean and sanitary. You are responsible for cleaning up your own mess. Unclean or unsanitary behavior or practices will not be tolerated. Many illnesses and diseases are transmitted in this manner.

Vehicle Safety

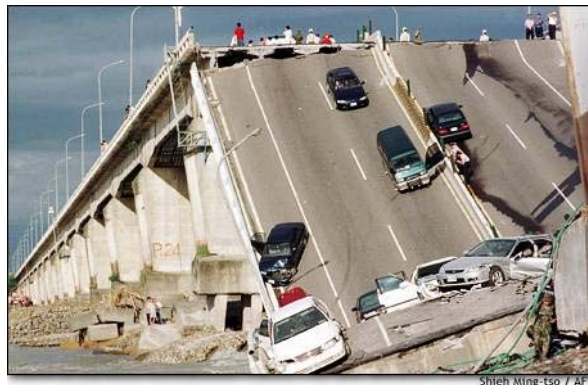
9/3/96

Policy



Company policy is to always drive in a safe manner. We believe in the old adage “better safe than sorry”. You are required to inspect any company vehicle or your own before you drive the vehicle on company business.

Safe Practices



- Vehicle accidents are a leading cause of work-related injuries and deaths. Vehicle operation while you are working must display safe driving habits and not reflect exhibitions of speed or recklessness. Compliance with all local, state, and federal traffic laws is required.
- You will always drive defensively by continually watching for hazardous conditions, understanding how to defend against them, and act in time to avoid problems. Keep your eyes and attention on the road and others. Adjust your speed and driving to changing weather and traffic conditions.
- Before you start your vehicle, it is required that you inspect the vehicle to ensure that all systems of the vehicle work properly. This is to include, but not limited to the following items: the brakes, lights, horn, tires, fluid levels for all systems, and all mirrors. Check the tires and the general condition of the vehicle. No employee may drive in a vehicle that is not safe. If you drive a vehicle, you accept the condition of

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the vehicle. Any item or system of the vehicle that is not in working order is to be reported to your supervisor. If the vehicle is not road worthy, the vehicle will not be driven.

- Whenever something extends two (2) feet or beyond the vehicle bumper in front or in back, you must put a red flag on it. Whenever material is carried on company or private vehicles, either tie downs or clamps must secure the material. Example: Pipe in gutters must have a minimum of two wraps with 3/16-inch cable to secure it to the vehicle. Cable wraps must secure pipe on the side of the vehicle, or else chain vised in the back and bungeed or duct taped in the front.
- DRIVERS LICENSES AND DRIVING RECORDS: All employees who, as a part of their duties, have need to operate vehicles on public roads must hold a valid, properly classed, driver's license and have a driving record acceptable to management and the state. Failure to do so may result in loss of driving privileges, change of assignment, or disciplinary action up to and including discharge.
- SEAT BELTS: Employees must wear always seat belts when operating or riding in an employer or employee owned vehicle, or when operating or riding as a passenger in any other vehicle during their employment. Whenever you drive or ride as part of your job duties, you must wear a seat belt.
- ALCOHOL AND DRUGS: The consumption of alcohol or drugs, (even some over-the-counter medications and prescriptions), can slow reactions, blur vision, reduce ability to determine distance, and impair judgment. It is, therefore, a violation of our safety policy for any employee to operate a vehicle with illegal drugs in his/her system or while impaired by alcohol, prescription drugs, or over-the-counter medications. You must inform your supervisor if you are taking or using any prescription or over the counter drug that bears a warning label. Failure to follow this procedure is grounds for reprimand or dismissal.

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Fueling

4/28/2001

Policy

You must exercise great care and follow all State and Federal laws. All care must be taken.

Safe Practices

- It is prohibited to fuel an internal combustion engine while the engine is running. **NO SMOKING** is allowed by the fueling operations.
- Fueling operations must be done in such a manner that likelihood of spillage will be minimal. When spillage occurs during fueling operations, the spilled fuel must be washed away completely or the fuel evaporated. All vapors must be controlled before restarting the engine.
- Fuel tank caps must be replaced and secured before starting the engine.
- In fueling operations, there must always be metal contact between the container and the fuel tank.
- Gasoline may not be handled or transferred to open containers.
- Open lights, flames, sparking or arcing equipment are prohibited near fueling or transfer of fuel.
- Fueling operations are prohibited in buildings or other enclosed areas that are not specifically ventilated for this purpose.

Personal Protection Equipment and Clothing

9/3/96

Policy

Eye

Approved safety glasses must be worn always in areas where there is a risk of eye injuries such as punctures, abrasions, contusions, or burns. Protective goggles or face shields must be worn where there is any danger of flying particles, **corrosive materials or hot materials**.

Ear Hearing



Protection against the effects of occupational noise exposure (ear plugs, etc.) must be used when sound levels exceed those of the Cal/OSHA noise standard.

PROTECT YOUR EARS

Head

Hard hats must be worn where danger of falling objects exists; they will be inspected periodically for damage to the shell and suspension system.

Hand

Protective gloves, aprons, shields, or other means must be used as needed to protect against cuts, corrosive liquids, hot liquids and chemicals.

Foot

Appropriate foot protection is required where there is a risk of foot injuries from hot, corrosive, or poisonous substances; falling objects; crushing penetrating actions or special Electrical Hazards.

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Respirator

Approved respirators must be used for regular or emergency use where needed and required by the MSDS. You may not use a respirator unless your supervisor has given you permission and you have received the proper training and medical review. For detailed respirator training and requirement see the respirator protection program under separate cover.

EYE AND FACE PROTECTION

1. Employee's shall use eye and face protective equipment, when machines or operations present potential eye or face injury from physical (dust, flying objects, ect.), chemical, or radiation agents.
 - a. All eye and face protection equipment shall meet the requirements of ANSI Z87.1, *Practice for Occupational and Educational Eye and Face Protection*, and bear a legible and permanent "Z87" logo to indicate compliance with the standard.
 - b. Employees shall use eye protection providing side protection when exposed to hazards from flying objects.
2. When required by this regulation to wear eye protection, persons whose vision requires the use of corrective lenses in eyeglasses shall be protected by one of the following:
 - a. eyeglasses with protective lenses providing optical correction,
 - b. goggles that can be worn over corrective lenses without disturbing the adjustment of the spectacles, or
 - c. Goggles that incorporate corrective lenses mounted behind the protective lenses.
3. Personnel working in other than administrative functions who are considered blind in one eye shall wear safety spectacles with side shields while on the job.
4. Operations that require the use of, or exposure to, hot or molten substances (e.g., babbitting, soldering, pouring or casting of hot metals, handling of hot tar, oils, liquids, and molten substances) shall require eye protection, such as goggles, with safety lenses and screens for side protection, or face masks, shields, and helmets giving equal protection. Lens mountings shall be able to retain in position all parts of a cracked lens.
5. Operations that require handling of harmful materials (e.g., acids, caustics, hot liquids, or creosoted materials) and operations where protection from gases, fumes, and liquids is necessary shall require the wearing of goggles with cups of soft pliable rubber or suitable face masks or hoods that cover the head and neck, and other protective clothing appropriate to the hazards involved.
6. Operations where protection from radiant energy with moderate reduction of visible light is necessary, including welding, cutting, brazing, and soldering, shall require eye and face protection suitable to the type of work, providing protection from all angles

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INC.**

of direct exposure, and with lenses of the appropriate shade.

7. Glare-resistant glasses with a minimum ultraviolet filter rating of 96% filtration at 400 nanometers shall be worn when conditions require protection against glare.
8. Tinted or automatically darkening lenses should not be worn when work tasks require the employee to pass from brightly to dimly lighted areas.

BODY HARNESSSES, LANYARDS, AND LIFELINES - SELECTION OF COMPONENTS

Personal fall arrest and positioning device systems.

Personal fall arrest systems require the use of body harnesses: body belts are not acceptable as part of personal fall arrest systems.

The use of a body belt is permitted in a positioning device system.

Body belts and harnesses.

Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials; shall have corrosion resistant finish; and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.

D-rings, snap hooks, and other connectors shall have a minimum tensile strength of 2,270 kg (5,000 lbs); D-rings and snap hooks shall be proof-tested to a minimum tensile load of 1,600 kg (3,600 lbs) without cracking, breaking, or taking permanent deformation. >

Proof testing is typically conducted by the manufacturer, and a specification of proof testing supplied with the manufactured good

Body belt/harness systems shall decelerate and bring the employee to a complete stop within 1 m (42 in), excluding lifeline elongation, after free fall distance.

Body belt/harness systems, when stopping or preventing a fall, shall not produce an arresting force on an employee of more than 10 times the employee's weight or 800 kg (1,800 lbs), whichever is lower.

Body belts shall be at least 4 cm (1-5/8 in) wide.

Lifelines and lanyards.

Lanyards and vertical lifelines shall have a minimum tensile strength of 2,270 kg (5,000 lbs).

Horizontal lifelines shall be designed, installed, and used, under the supervision of a qualified person, as part of a complete personal fall arrest system, which maintains a factor of safety of at least two.

Self-retracting lifelines and lanyards that automatically limit free fall distance to 60 cm (2 ft) or less shall be capable of sustaining a minimum tensile load of 1,360 kg (3,000 lbs) applied to the device with the lifeline or lanyard in the fully extended position. Self-retracting lifelines and lanyards that do not limit free fall distance to 60 cm (2 ft) or less, rip stitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 2,270 kg (5,000 lbs) applied to the device with the lifeline or lanyard in the fully extended position.

Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body belts and body harnesses shall be made from synthetic fibers.

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Lineman's equipment.

All fabric for safety straps shall be capable of withstanding an alternating current dielectric test of not less than 25,000 volts per foot "dry" for 3 minutes, without visible deterioration.

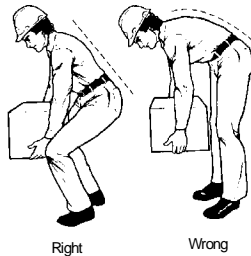
All fabric and leather used shall be capable of being tested for leakage current and not exceed 1 milliamp ere when a potential of 3,000 volts is applied to the electrodes 30 cm (12 in) apart.

Direct current testing may be permitted in lieu of alternating current testing.

Lifting

9/3/96

Policy



Your back is so important to your health and work that here at Employee Employer Assistance Programs, Inc., we want you to take a moment and consider just how often you use your back. Can you think of any activity that does not include the back? With this in mind consider the following safe practices. Remember, you may not get a second chance.

Safe Practices

- Back injuries can happen as quickly as just one wrong move. With this in mind, remember that you should wear and use back braces or lifting belts every time you lift anything. A common misunderstanding is that you should keep the belt or brace fastened at all times. This is not correct. Fasten the back belt only when you are lifting or pushing a load. Of course, if you have received your belt or back brace from your doctor, you must follow your doctors directions.
- Lifting and carrying objects can be safer if:
- When lifting items from below arm level, bend your knees, not your back, to lower your body to the object.
- Bring the load as close as possible to the body before lifting.
- Grip firmly with your hands, (not just fingers), and keep your arms and elbows tucked in for more strength.
- Lift by letting your legs push you up, not your back.
- Be sure you can see where you are going and move slowly enough to avoid bumping into other objects.
- Do not twist your body while carrying heavy objects; twisting is a major cause of injury. If you need to change directions, move your feet in that direction first.

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- Lifting is safest when you keep your back straight and your stomach muscles tight. Staying in good physical condition and getting proper exercise are also important.
- Loads will be broken down to movable weights, routes will be planned, and legs will be used to do the work. If an object is too heavy, you must get help such as a handcart or other device.

Exits and Egress

9/3/96

Policy

All exits and egresses must and will be kept clear at all times. Remember that exits and egresses are the only way you can get out of a building or area, if an emergency occurs. There cannot be a greater feeling of panic or helplessness than being trapped and not being able to get out of a building when you really need to. Always know how and where to get out of your work area.

Safe Practices

All exit doors and passages must be clear and free of obstruction.

Exit signs, and their illuminating light sources, must always be in place, and kept clear of obstruction.

At least two means of egresses must be kept open from elevated platforms, pits, or rooms where the absence of a second exit would increase the risk of injury from hot, poisonous, corrosive, suffocating, flammable, or explosive substances.

All exit doors must remain unlocked (or have panic devices) during business hours.

Walkways

11/30/99

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Policy

As we think about walkways, and what they mean to you as an employee, think about how you are going to get out of your work area if the walkways are blocked or have obstructions. With this in mind, the company policy is that all walkways are to be kept open at all times. If you must block a walkway for a short period of time to put away materials, restock shelves or rearrange materials, you must make sure that there is another avenue to exit your work area and that this walkway is clear and that all affected employees are notified to use this alternate walkway.

Safe Practices

Aisles and passageways must be kept clear of obstruction.

Materials spilled in walkways must be cleaned up immediately.

When present, markings on aisles and walkways must be obeyed.

Materials or equipment must be stored so that sharp projections will not interfere with walkways.

Materials must be stored so adequate headroom is provided for the entire length of any aisle or walkway.

Safe clearance must be allowed for walking in aisles where motorized or mechanical handling equipment is operating.

Bridges over conveyors and similar hazards must be kept in place.

Stairs and Stairways

11/30/99

Policy

Because the nature of a stairway is dangerous, we must insist that you take great care in using the stairs. All violations of the following rules will be enforced.

Safe Practices

- Safety Rails are never to be removed from stairways or landings.
- Handrails on stairways must be used to prevent falling. Steps must be taken one at a time. Jumping, running, leaping or skipping stairs is a safety violation and will not be tolerated.
- Slip resistant material applied on the surface of steps must not be removed.
- Where stairs or stairways exit directly into any area where vehicles may be operated, barriers and warnings must be followed to prevent stepping into the path of traffic.
- Where stairs are covered with any material such as carpets flooring or other material, care must be used to keep from tripping or stumbling on covering materials.

Elevated Surfaces

11/30/99

Policy

Anytime you store or place material in an elevated position you can create a hazard. Therefore, the policy at Employee Employer Assistance Programs, Inc. is that all of our employees are to stack and store all materials in a safe and neat manner. You are required to inform your supervisor if you find material stacked or stored in a hazardous manner. Remember, you can make a difference. You must not stack or store material in an elevated area that is not prepared to receive the material. The area that you are storing material in must have the required toe boards, railings and other safety systems.

Safe Practices

- The load capacity of elevated surfaces must not be exceeded. The maximum load must be clearly marked on structural surfaces or areas.
- Guardrails, toe boards, and other protective devices on elevated surfaces must be kept in place.
- Means of access and egress provided to elevated storage and work surfaces must not be removed.
- Material on elevated surfaces must be piled, stacked or racked in a manner to prevent it from tipping, falling, collapsing, rolling or spreading.
- Dock boards or bridge plates must be used when transferring materials between docks and trucks or rail cars.

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Floor Openings

9/3/96

Safe Practices:

1. Floor openings and pits must be covered or otherwise protected by a guardrail or equivalent on all sides (except at the entrance to stairways or ladders).
2. Grates or other covers over floor drains, manholes, and similar openings must be kept in place.
3. The unused portions of service pits and pits not actually in use must either be covered or protected by guardrails or an equivalent.

Hand Tools

11/30/99

Policy



We all use some form of hand tools, from staplers to pliers. Great care must be used in the selection and care of these tools. Only quality tools will be used whether the tool is company supplied or one that you supply as part of your job. You are required to take care of and use hand tools in a commonsense way.

Safe Practices

- All hand tools and equipment (both employer and employee owned) used by employees at the workplace must be in good condition. Worn or bent tools must be replaced. Broken or

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fractured handles on any hand tool must be replaced promptly. Appropriate handles must be used on files and similar tools. Tool handles must be wedged tightly in the head of all tools. Tool cutting edges must be kept sharp so the tool will move smoothly without binding or skipping.

- Appropriate safety glasses, face shields, etc. must be used while using hand tools or equipment that might produce flying materials or be subject to breakage.

- **HAMMERS:** The correct hammer must be used for the job. One hammer must never be used to strike a second hammer to gain additional striking power. Hammers will be grasped firmly, close to the end of the handle; objects will be struck with the full face of the hammer. Broken or fractured handles must be replaced promptly. Hammers with loose heads must be repaired before use; those with chipped or mushroomed faces will be discarded.



- **PLIERS/CUTTERS/PRYBARS:** Plastic or vinyl covered pliers handles are not intended to act as insulation, they must not be used on live electrical circuits. Pliers or cutters will be used for cutting hardened wire only if they were designed for that purpose. Cuts will always be made at right angles. Pry-bars must never be used as a chisel, punch or hammer.

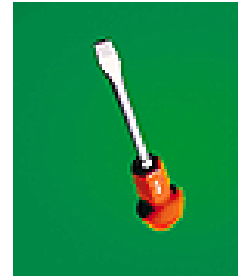
- **WRENCHES:** The proper wrench must be used for the job. A pipe is never to be used as an extension on a wrench handle. If possible, always pull toward you with the wrench handle and adjust your stance to prevent a fall if something lets go; never cock a wrench. Never use a hammer on any wrench (other than a "striking face" wrench) or use a pipe wrench to bend, raise, or lift a pipe. Discard any wrench with broken or battered points.



- **SOCKETS AND RATCHETS:** Select the right size socket for the job; never cock any wrench or socket. Sockets will be kept clean and those showing cracks or wear will be discarded. Only "impact sockets" will be used with air or electric impact wrenches; "hand sockets" must not be used on power or impact wrenches. Approved eye protection must be worn when using power or impact sockets. Ratchet mechanisms will be cleaned and lubricated periodically with light grade oil. A ratchet head will be supported when using socket extensions. When breaking loose a fastener, a small amount of pressure will be applied as a test to be sure the gear wheel is engaged with the pawl. A hammer will never be used on a ratchet nor will a pipe be used to extend the handle for added leverage.

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- **PUNCHES/CHISELS:** A punch or chisel with a chipped or mushroomed end must not be used; mushrooms will be dressed with a file. Punches and chisels will be held with a tool holder if possible. When using a chisel on a small piece, the piece will be clamped firmly in a vise and the chipping made toward the stationary jaw.
- **SCREWDRIVERS:** The proper type of screwdriver must be used for the job and the tip matched to the fastener. Pozidriv, Phillips, and Reed and Prince screwdrivers will not be interchanged. Screwdrivers must not be used for prying, punching, chiseling, scoring, or scraping. Screwdriver handles are not intended to act as insulation and must not be used on live electrical circuits. Screwdrivers with rounded edges will be redressed with a file.
- **TOOL STORAGE UNITS:** Not more than one loaded drawer will be open at a time. Each drawer will be closed before opening the next. Lids will be closed and drawers locked before storage units are moved; they will be moved by pushing, not pulling. Once in place, the brakes on locking casters must be set.
- **TOOLS** must be checked into and out of the place of business and building/job, through your supervisor, regardless of who the tools belong to, even if the tools are your personal property. Failure to follow this requirement may result in your dismissal.



HAND AND PORTABLE POWERED TOOLS

Tools are such a common part of our lives that it is difficult to remember that they may pose hazards. All tools are manufactured with safety in mind but, tragically, a serious accident often occurs before steps are taken to search out and avoid or eliminate tool-related hazards.

In the process of removing or avoiding the hazards, workers must learn to recognize the hazards associated with the different types of tools and the safety precautions necessary to prevent those hazards.

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Hand Tools

Hand tools are non-powered. They include anything from axes to wrenches. The greatest hazards posed by hand tools result from misuse and improper maintenance.

Some examples:

- Using a screwdriver as a chisel may cause the tip of the screwdriver to break and fly, hitting the user or other employees.
- If a wooden handle on a tool such as a hammer or an axe is loose, splintered, or cracked, the head of the tool may fly off and strike the user or another worker.
- A wrench must not be used if its jaws are sprung, because it might slip.
- Impact tools such as chisels, wedges, or drift pins are unsafe if they have mushroomed heads. The heads might shatter on impact, sending sharp fragments flying.

The employer is responsible for the safe condition of tools and equipment used by employees but the employees have the responsibility for properly using and maintaining tools.

Employers should caution employees that saw blades, knives, or other tools be directed away from aisle areas and other employees working in close proximity. Knives and scissors must be sharp. Dull tools can be more hazardous than sharp ones.

Appropriate personal protective equipment, e.g., safety goggles, gloves, etc., should be worn due to hazards that may be encountered while using portable power tools and hand tools.

Safety requires that floors be kept as clean and dry as possible to prevent accidental slips with or around dangerous hand tools.

Around flammable substances, sparks produced by iron and steel hand tools can be a dangerous ignition source. Where this hazard exists, spark-resistant tools made from brass, plastic, aluminum, or wood will provide for safety.

Power Tool Precautions

Power tools can be hazardous when improperly used. There are several types of power tools, based on the power source they use: electric, pneumatic, liquid fuel, hydraulic, and powder-actuated.

Employees should be trained in the use of all tools - not just power tools. They should understand the potential hazards as well as the safety precautions to prevent those hazards from occurring.

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Power tool users should observe the following general precautions:

- Never carry a tool by the cord or hose.
- Never yank the cord or the hose to disconnect it from the receptacle.
- Keep cords and hoses away from heat, oil, and sharp edges.
- Disconnect tools when not in use, before servicing, and when changing accessories such as blades, bits and cutters.
- All observers should be kept at a safe distance away from the work area.
- Secure work with clamps or a vise, freeing both hands to operate the tool.
- Avoid accidental starting. The worker should not hold a finger on the switch button while carrying a plugged-in tool.
- Tools should be maintained with care. They should be kept sharp and clean for the best performance. Follow instructions in the user's manual for lubricating and changing accessories.
- Be sure to keep good footing and maintain good balance.
- The proper apparel should be worn. Loose clothing, ties, or jewelry can become caught in moving parts.
- All portable electric tools that are damaged shall be removed from use and tagged "Do Not Use."

Guards

Hazardous moving parts of a power tool need to be safeguarded. For example, belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or moving parts of equipment must be guarded if such parts are exposed to contact by employees.

Guards, as necessary, shall be provided to protect the operator and others from the following:

- point of operation,
- in-running nip points,
- rotating parts, and
- Flying chips and sparks.

Safety guards must never be removed when a tool is being used. For example, portable circular saws must be equipped with guards. An upper guard must cover the entire blade of the saw. A retractable lower guard must cover the teeth of the saw, except when it makes contact with the work material. The lower guard must automatically return to the covering position when the tool is withdrawn from the work.

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Safety Switches

The following hand-held powered tools must be equipped with a momentary contact "on-off" control switch: drills, tapers, fastener drivers, horizontal, vertical and angle grinders with wheels larger than 2 inches in diameter, disc and belt sanders, reciprocating saws, saber saws, and other similar tools. These tools also may be equipped with a lock-on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.

The following hand-held powered tools may be equipped with only a positive "on-off" control switch: platen sanders, disc sanders with discs 2 inches or less in diameter; grinders with wheels 2 inches or less in diameter; routers, planers, laminate trimmers, nibblers, shears, scroll saws and jigsaws with blade shanks 1/4-inch wide or less.

Other hand-held powered tools such as circular saws having a blade diameter greater than 2 inches, chain saws, and percussion tools without positive accessory holding means must be equipped with a constant pressure switch that will shut off the power when the pressure is released.

Electric Tools

Employees using electric tools must be aware of several dangers; the most serious is the possibility of electrocution.

Among the chief hazards of electric-powered tools are burns and slight shocks which can lead to injuries or even heart failure. Under certain conditions, even a small amount of current can result in fibrillation of the heart and eventual death. A shock also can cause the user to fall off a ladder or other elevated work surface.

To protect the user from shock, tools must either have a three-wire cord with ground and be grounded, be double insulated, or be powered by a low-voltage isolation transformer. Three-wire cords contain two current-carrying conductors and a grounding conductor. One end of the grounding conductor connects to the tool's metal housing. The other end is grounded through a prong on the plug. Anytime an adapter is used to accommodate a two-hole receptacle, the adapter wire must be attached to a known ground. The third prong should never be removed from the plug.

Double insulation is more convenient. The user and the tools are protected in two ways: by normal insulation on the wires inside, and by a housing that cannot conduct electricity to the operator in the event of a malfunction.

These general practices should be followed when using electric tools:

- Electric tools should be operated within their design limitations.

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- Gloves and safety footwear are recommended during use of electric tools.
- When not in use, tools should be stored in a dry place.
- Electric tools should not be used in damp or wet locations.
- Work areas should be well lighted.

Powered Abrasive Wheel Tools

Powered abrasive grinding, cutting, polishing, and wire buffing wheels create special safety problems because they may throw off flying fragments.

Before an abrasive wheel is mounted, it should be inspected closely and sound- or ring-tested to be sure that it is free from cracks or defects. To test, wheels should be tapped gently with a light non-metallic instrument. If they sound cracked or dead, they could fly apart in operation and so must not be used. A sound and undamaged wheel will give a clear metallic tone or "ring."

To prevent the wheel from cracking, the user should be sure it fits freely on the spindle. The spindle nut must be tightened enough to hold the wheel in place, without distorting the flange. Follow the manufacturer's recommendations. Care must be taken to assure that the spindle wheel will not exceed the abrasive wheel specifications.

Due to the possibility of a wheel disintegrating (exploding) during start-up, the employee should never stand directly in front of the wheel as it accelerates to full operating speed.

Portable grinding tools need to be equipped with safety guards to protect workers not only from the moving wheel surface, but also from flying fragments in case of breakage.

In addition, when using a powered grinder:

- Always use eye protection.
- Turn off the power when not in use.
- Never clamp a hand-held grinder in a vise.

Pneumatic Tools

Pneumatic tools are powered by compressed air and include chippers, drills, hammers, and sanders.

There are several dangers encountered in the use of pneumatic tools. The main one is the danger of getting hit by one of the tool's attachments or by some kind of fastener the worker is using with the tool.

Eye protection is required and face protection is recommended for employees working with pneumatic tools.

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Noise is another hazard. Working with noisy tools such as jackhammers requires proper, effective use of hearing protection.

When using pneumatic tools, employees must check to see that they are fastened securely to the hose to prevent them from becoming disconnected. A short wire or positive locking device attaching the air hose to the tool will serve as an added safeguard.

A safety clip or retainer must be installed to prevent attachments, such as chisels on a chipping hammer, from being unintentionally shot from the barrel.

Screens must be set up to protect nearby workers from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.

Compressed air guns should never be pointed toward anyone. Users should never "dead-end" it against themselves or anyone else.

Powder-Actuated Tools

Powder-actuated tools operate like a loaded gun and should be treated with the same respect and precautions. In fact, they are so dangerous that they must be operated only by specially trained employees.

Safety precautions to remember include the following:

- These tools should not be used in an explosive or flammable atmosphere.
- Before using the tool, the worker should inspect it to determine that it is clean, that all moving parts operate freely, and that the barrel is free from obstructions.
- The tool should never be pointed at anybody.
- The tool should not be loaded unless it is to be used immediately. A loaded tool should not be left unattended, especially where it would be available to unauthorized persons.
- Hands should be kept clear of the barrel end. To prevent the tool from firing accidentally, two separate motions are required for firing: one to bring the tool into position, and another to pull the trigger. The tools must not be able to operate until they are pressed against the work surface with a force of at least 5 pounds greater than the total weight of the tool.

If a powder-actuated tool misfires, the employee should wait at least 30 seconds, then try firing it again. If it still will not fire, the user should wait another 30 seconds so that the faulty cartridge is less likely to explode, then carefully remove the load. The bad cartridge should be put in water.

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Suitable eye and face protection are essential when using a powder-actuated tool.

The muzzle end of the tool must have a protective shield or guard centered perpendicularly on the barrel to confine any flying fragments or particles that might otherwise create a hazard when the tool is fired.

The tool must be designed so that it will not fire unless it has this kind of safety device.

All powder-actuated tools must be designed for varying powder charges so that the user can select a powder level necessary to do the work without excessive force.

If the tool develops a defect during use it should be tagged and taken out of service immediately until it is properly repaired.

Fasteners

When using powder-actuated tools to apply fasteners, there are some precautions to consider. Fasteners must not be fired into material that would let them pass through to the other side. The fastener must not be driven into materials like brick or concrete any closer than 3 inches to an edge or corner. In steel, the fastener must not come any closer than one-half inch from a corner or edge. Fasteners must not be driven into very hard or brittle materials which might chip or splatter, or make the fastener ricochet.

An alignment guide must be used when shooting a fastener into an existing hole. A fastener must not be driven into a spalled area caused by an unsatisfactory fastening.

Hydraulic Power Tools

The fluid used in hydraulic power tools must be an approved fire-resistant fluid and must retain its operating characteristics at the most extreme temperatures to which it will be exposed.

The manufacturer's recommended safe operating pressure for hoses, valves, pipes, filters, and other fittings must not be exceeded.

Jacks

All jacks - lever and ratchet jacks, screw jacks, and hydraulic jacks - must have a device that stops them from jacking up too high. Also, the manufacturer's load limit must be permanently marked in a prominent place on the jack and should not be exceeded.

A jack should never be used to support a lifted load. Once the load has been lifted, it must immediately be blocked up.

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Use wooden blocking under the base if necessary to make the jack level and secure. If the lift surface is metal, place a 1-inch-thick hardwood block or equivalent between it and the metal jack head to reduce the danger of slippage.

To set up a jack, make certain of the following:

- the base rests on a firm level surface,
- the jack is correctly centered,
- the jack head bears against a level surface, and
- the lift force is applied evenly.

Proper maintenance of jacks is essential for safety. All jacks must be inspected before each use and lubricated regularly. If a jack is subjected to an abnormal load or shock, it should be thoroughly examined to make sure it has not been damaged.

Hydraulic jacks exposed to freezing temperatures must be filled with an adequate antifreeze liquid.

General Safety Precautions

Employees who use hand and power tools and who are exposed to the hazards of falling, flying, abrasive and splashing objects, or exposed to harmful dusts, fumes, mists, vapors, or gases must be provided with the particular personal equipment necessary to protect them from the hazard.

Following five basic safety rules can prevent all hazards involved in the use of power tools:

- Keep all tools in good condition with regular maintenance.
- Use the right tool for the job.
- Examine each tool for damage before use.
- Operate according to the manufacturer's instructions.
- Provide and use the proper protective equipment.

Employees and employers have a responsibility to work together to establish safe working procedures. If a hazardous situation is encountered, it should be brought to the attention of the proper individual immediately.

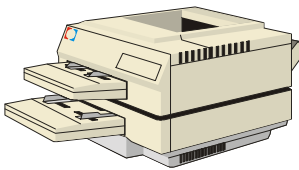
Portable Power Tools

11/30/99

Policy



Power tools come in all shapes and sizes. When most people think of power tools, they think of skill saws and power drills. Remember, if the tool has a power cord, then it is a power tool. Some examples are: power staplers, pencil sharpeners, shredders, meat slicers, meat grinders, computer printers, computers, and the list go on. So, even if you are sitting in an office, you use and are exposed to power tools everyday.



When working with any kind of power-operated tool, always remember to *think safety*. Any short-cut you might use to speed your job could result in severe injury to you or a fellow employee. Common sense is the key. If you have any questions regarding the tool you are working with, remember to ask your supervisor. No question is silly or dumb!

Before we go further, let's check every power tool to make sure that the cord is safe. Remember, we do not allow tape to be used to repair a broken or frayed cord. If the cord is broken, frayed or just pulled out of the tool or plug, it must be fixed. All broken or bent tools need to be replaced.

Safe Practices

- All power tools should be used with a ground fault interrupter.
- Power tools must be used with the correct shield, guard or attachment as recommended by the manufacturer. Removal of any guard without the approval of management is grounds for discharge. **Do not do it!**
- The safety guards on grinders, saws and similar equipment must be in place during operation.



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- Portable circular saws must have guards above and below the base shoe.
- Circular saw guards will be checked to assure that they are not wedged up, thus leaving the lower portion of the blade unguarded.
- Portable equipment with rotating or moving parts must be used in such a manner as to prevent physical contact during operation.
- All cord-connected, electrically operated tools and equipment must be effectively grounded or be of the approved double insulated type.
- Guards must be in place over all belts, pulleys, chains and sprockets on all portable tools and equipment.
- Portable fans must be guarded with grates or screens having openings of 1/2 inch or less.
- If hoisting equipment is available and used for lifting heavy objects, its ratings and characteristics must be right for the task.
- Pneumatic and hydraulic hoses on power-operated tools must be checked regularly for failure or damage.
- Only recommended accessories with proper capacity ratings may be used on portable power tools. Air pressure ratings must not be exceeded on any power tool.
- The air supply line to air hammers will be disconnected before attaching bits. Bits will be against a work surface before air hammers are operated.

Portable Ladders

11/30/99

Policy

You must inspect all ladders before you can use them. If the ladder is in need of repair you must not use it.

Safe Practices

- All ladders must be maintained in good condition. The joints between steps and side rails must be tight. All hardware, fittings, and non-slip safety feet will always be

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securely attached as well as movable parts operating freely without binding or undue play.

- Ladder rungs and steps must be free of grease and oil.
- Ladders may not be placed in front of doors opening toward the ladder, except when the door is blocked open, locked, or guarded.
- Ladders may not be placed on boxes, barrels, or other unstable bases to get additional height.
- Ladders must be faced when ascending or descending.
- Ladders that are broken, missing steps, rungs, cleats or that have broken side rails, or other faulty equipment, may not be used. You must report this to your supervisor.
- The top step of an ordinary stepladder must not be used as a step.
- When portable rung ladders are used to gain access to elevated platforms, roofs, etc., the ladder must always extend at least three feet above the elevated surface.
- When portable rung or cleat type ladders are used, the base must be placed, lashed, or otherwise held in place so slipping will not occur.
- Ladders may not be used as guys, braces, skids, gin poles, or for anything other than their intended purpose.
- Extension ladders must only be adjusted while standing at a base (not while standing on the ladder or from a position above the ladder).

Lockout/Blockout Procedures

9/3/96

Policy

All machinery or equipment capable of movement must be de-energized, released and blocked, locked-out or tagged-out during cleaning, servicing, adjusting, or setting up operations. The specific procedures listed in the lockout tagout program must be followed. The main power must be locked-out, not just a control circuit; stored energy (mechanical, hydraulic, air, etc.) must be released or blocked. Failure to implement the lockout tagout program is grounds for up to and including termination.

Safe Practices

- All Employees must have the approval of management to perform lockout blockout.
- You must have received the specific training on the unique piece of equipment that is to be locked out or blocked out.
- You must follow the specific procedure outlined in the lockout tagout procedure.
- The locks/tags must identify all employees who are working on locked-out equipment. Employees must keep control of their keys while their safety locks are in use. Only the employee exposed to the hazard is permitted to place or remove a safety lock during a lockout/blockout procedure.
- The employee exposed to the hazard will check the safety of the lockout by trying a start up, after making sure no one is exposed.
- When machine operations, configuration, or size requires the operator to leave his/her control station to install tools or perform other operations, and that part of the machine could move if accidentally started, such element must be separately locked or blocked out.
- If that equipment or lines cannot be shut down, locked-out, and tagged, a safe procedure directed by management for that particular situation must be followed.
- The control circuit stop button will be pushed before you start re-energizing the main power switch.

Laser Equipment Non-ionizing Radiation

11/28/99

Policy

The following rules and instructions are for the servicing and repairing of laser equipment. The equipment currently in use at Employee Employer Assistance Programs, Inc. is used for Safety. The laser equipment is not used to cut or burn, but to align items. Only qualified and trained employees shall be assigned to install, adjust, and operate laser equipment.

Safe Practices

Proof of qualification of the laser equipment operator shall be available and be kept in possession of operator at all times.

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Employees, when working in areas in which a potential exposure to direct or reflected laser light greater than 0.005 watt (mill watts) exists, shall wear anti laser eye protection devices as specified in section 1516 (e) of the Health and Safety Code.

Beam shutters or caps shall be utilized, or the laser turned off, when laser transmission is not actually required. When the laser is left unattended for a substantial period of time, such as during lunch hour, overnight, or during shift changes, the laser shall be turned off.

Only mechanical or electronic means shall be used as a detector for guiding the internal alignment of the laser.

The laser beam shall not be directed at employees or anyone else.

When it is raining or snowing, or when there is dust or fog in the air, the operation of laser systems shall be prohibited where practicable. In any event, employees and workers shall be kept out of range of the area of source and target, during such weather conditions.

Laser equipment shall bear a label to indicate maximum output.

Employees and workers shall not be exposed to light intensities above the following descriptions:

Direct staring: 1 microwatt per square centimeter

Incidental observing: 1 mill watt per square centimeter

Workers or employees shall not be exposed to microwave power densities in excess of 10 mill watts per square centimeter.

Workers or employees working in location where there is a risk of receiving eye injuries, such as punctures, abrasions, hazardous substances, projections or injurious light rays, which are inherent in the work or environment, shall wear face or eye protection suitable to the danger.

EMPLOYEE EMPLOYER ASSISTANCE PROGRAMS, INC.

Electrical

9/3/96

Policy

We cannot emphasize too strongly how important it is to take the proper care and safeguards with regard to electricity. Most of the time you do not get a second chance. Therefore, you must be careful. Take the time to be safe. Follow the safe practices outlined below. Use common sense. Keep away from water when exposed to electrical equipment. Before starting work on any electrical circuit, all voltage must be checked and verified to ensure that the work can be done in a safe manner. Only qualified persons shall work on electrical equipment or systems. Only qualified persons shall be permitted to perform any function in proximity to energized overhead conductors, unless accidental contact has been suitably guarded against.

Safe Practices

- All employees must report, as soon as practical, any obvious hazard to life or property seen about electrical equipment or lines. Preliminary inspections, or appropriate tests must be made to find what conditions exist before starting work on electrical equipment or lines. Do not start work until you are sure it is safe.
- It is the policy of our company to use a ground fault interrupter whenever the tool being used is not double insulated or the electrical outlet is not grounded and where the electrical equipment or device does not have an internal GFI. There are no exceptions to this policy.
- All machines, equipment, appliances, portable electrical tools, and extension cords must be grounded or have a grounding conductor as applicable. Any employee who cuts off a ground lug will be subject to corrective action up to and including termination.
- In wet or damp locations, electrical tools and equipment must be appropriately protected and grounded. You may not use electrical tools in damp or wet locations without your supervisor's specific permission.
- The location of electrical power lines and cables (overhead, underground, under floor, other side of walls, etc.) must be determined before digging, drilling, or similar work is begun.

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- Metal measuring tapes, ropes, hand lines or similar devices with metallic thread woven into the fabric are prohibited where they could meet energized parts of equipment or circuit conductors.
- The use of metal ladders is prohibited in areas where the ladder or the person using the ladder could meet with energized parts of equipment, fixtures, or circuit conductors.
- All disconnecting means must be opened before fuses are replaced.
- Employees are prohibited from working alone on energized lines or equipment over 600 volts.
- Employees are prohibited from modifying any electrical appliance or equipment.
- During maintenance, all safety measures must be kept in-place.
- All covers, plates or panels will be kept in-place during business hours, or put back in place at the end of the shift.

Energized Equipment or Systems

- Work shall not be performed on exposed energized parts of equipment or systems until the following conditions are met:
- Responsible supervision has determined that the work is to be performed while the equipment or systems are energized.
- Involved personnel have received instructions on the work techniques and hazards involved in working on energized equipment.
- Suitable personal protective equipment has been provided and is used. Suitable insulated gloves shall be worn for voltages in excess of 250 volts, nominal.
- Suitable eye protection has been provided and is used.
- Where required, suitable barriers, barricades, tags, or signs are in place for personnel protection.
- After the required work on an energized system or equipment has been completed, an authorized person shall be responsible for:
- Removing from the work area any temporary personnel protective equipment.
- Reinstalling all permanent barriers or covers.

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- All electrical equipment and systems shall be treated as energized until tested or otherwise proven to be de-energized.

De-Energized Equipment or Systems

- An authorized person shall be responsible for the following before working on de-energized electrical equipment or systems, unless the equipment is physically removed from the wiring system:
- Notifying all involved personnel.
- Locking the disconnecting means in the "open" position with the use of lockable devices, such as padlocks and combination locks, or disconnecting the conductor(s) or other positive methods or procedures which will effectively prevent unexpected or inadvertent energizing of a designated circuit, equipment or appliance.

EXCEPTION:

- Locking is not required under the following conditions:
- Where suitable tagging procedures are used, and where the disconnecting means is accessible only to personnel instructed in these tagging procedures.
- Tagging the disconnecting means with suitable accident prevention tags.
- Effectively blocking the operation or dissipating the energy of all stored energy devices which present a hazard, such as capacitors or pneumatic, spring loaded and like mechanisms.

Energizing

(Or Re-Energizing) Equipment or Systems

An authorized person shall be responsible for the following before energizing equipment or systems, which have been de-energized:

- Determining that all persons are clear from hazards, that could result from the equipment or systems being energized.
- Removing locking devices and tags.
- Only the employee who placed them may remove locking devices and tags. Locking devices and tags shall be removed upon completion of the work and after the installation of the protective guards and/or safety interlock systems.

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EXCEPTION:

When the employee has left the premises, or is otherwise unavailable, other persons who are authorized by your employer to remove the locking devices and tags may do so. If you are not authorized, you must not remove any locking devices and tags.

Electrical Clearances

9/3/96

Policy

Your safety is of paramount importance. You must follow the distances outlined in this section at all times. Failure to do so may result in serious injury and may result in up to and including discharge.

Safe Practices

- No employee shall be permitted to approach or take any conductive object without an approved insulating handle closer to exposed energized parts than shown in the table unless:
- The employee is insulated or guarded from the energized part (gloves or gloves with sleeves rated for the voltage involved shall be considered insulation of the employee from the energized part).
- The energized part is insulated or guarded from the employee, and any other conductive object, at a different potential.
- When performing work with live line tools, minimum clear distances, according to the table, shall be maintained. Conductor support tools, such as link sticks, strain carriers, and insulator cradles, shall be permitted to be used, provided that the clear insulation is at least as long as the insulator string or the minimum distance specified in the table for the operating voltage.

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ALTERNATING CURRENT MINIMUM APPROACH DISTANCE

Nominal Voltage Range (Phase to Phase) Kilovolt	Minimum Approach Distance Phase to Ground Exposure	
ABOVE: 0.6 TO	15	2 FT. 1 IN.
ABOVE: 15 TO	36	2 FT. 4 IN.
ABOVE: 36 TO	46	2 FT. 7 IN.
ABOVE: 46 TO	72.5	3 FT. 0 IN.
ABOVE: 72.5 TO	121	3 FT. 4 IN.
ABOVE: 121 TO	145	3 FT. 7 IN.
ABOVE: 145 TO	169	4 FT. 0 IN.
ABOVE: 169 TO	242	5 FT. 3 IN.
ABOVE: 242 TO	362	8 FT. 6 IN.
ABOVE: 362 TO	552	11 FT. 3 IN.
ABOVE: 552 TO	765	15 FT. 0 IN.

NOTE: Above 242 KV the minimum working distance and the minimum approach distance shall be permitted to be reduced provided that such distances are not less than the shortest distance between the energized part and a grounded surface.

This article shall apply to all line clearance operations performed in the vicinity of exposed energized overhead conductors and equipment, where any part of the employee's body, tools or equipment being used, or parts of trees being worked upon, is likely to come within the distances specified in Section 2946(b)(2).

Nominal Voltage (Phase to Phase)	Minimum Required Clearance (Feet)
Over 600 50,000	6'
Over 50,000 345,000	10'
Over 345,000 750,000	16'
Over 750,000 1,000,000	20'

Inclement Weather

- Work on, or from structures shall be discontinued when adverse weather, such as high winds, ice on structures, or the progress of an electrical storm in the immediate vicinity, makes the work hazardous, except during emergency restoration procedures.

Fall Protection Personal

09/12/96

Policy

Fall protection must be worn whenever you are more than 7 1/2 feet from the ground, and the working platform does not provide fall protection as part of its standard equipment.

Safe Practices

- All workers utilizing fall protection must read and understand all information contained in this section.
- Fall protection training is required as an integral part of our comprehensive safety program.
- All warnings and instructions must be read and understood before using equipment.
- Only trained personnel may use equipment.
- All users must understand all OSHA regulations, ANSI standards, company policy, and other relevant regulations and standards pertaining to fall protection equipment.
- All equipment must be visually inspected before each use.
- A qualified person on a regular basis must inspect all equipment. All equipment will be inspected before each use and at the beginning of each installation.
- Equipment must not be altered in any way.
- Any product exhibiting deformities, unusual wear, or deterioration must be immediately discarded.
- Any equipment subject to a fall must not be used again.
- Never use fall protection equipment for purposes other than those for which it was designed. Fall protection equipment should never be used for towing or hoisting.

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Always check for obstructions below the work area to make sure potential fall path is clear.

All synthetic material must be protected from slag, hot sparks, open flames, or other heat sources.

- Environmental hazards should be considered when selecting fall protection equipment. Polyester should not be used in certain chemical or acidic environments.
- Maximum working load is 310 lbs., unless otherwise labeled.

A comprehensive fall protection program must be viewed as a "total system," beginning with hazard identification and ending with ongoing management review. The three key components of the Employee Employer Assistance Programs, Inc. system need to be in place, and properly used, to provide maximum fall protection. The following information is intended to help in your training and to refresh you while working with fall protection. You must use and follow all safety instructions.

THREE SYSTEM COMPONENTS

Body Wear

The first component is the personal protective gear worn by workers while performing the job. Because harnesses are the most appropriate equipment to be worn in the event of a free fall, more and more workers are using this type of device. We have chosen this type of body wear because of the type of work and hazards we encounter most of the time in our type of work. You may request a different type of body wear, but remember the body wear must be a harness type.

Connecting Devices

The second system component is the connecting device. This device is most commonly a rope or webbing lanyard, but may also be a rope grab or retractable lifeline.

Anchor Point

The final component of the system is the anchor or tie-off point. This point must be capable of supporting 5,000 pounds per worker, such as an eyebolt or support beam. Individually, none of these components will provide protection from a fall. Used properly with each other, they become a critically important part of the "total fall protection system".

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Fall Protection Systems:

May be broken down into four functional categories:

Fall Arrest, Positioning, Suspension, and Retrieval.

Fall Arrest

A fall arrest system is required if any risk that a worker may fall from an elevated position exists.

As a general rule, it is recommended that a fall arrest system be used any time a working height of five feet or more is reached. Working height is defined as the distance from the walking/working surface to a grade or lower level.

A fall arrest system is designed to be passive and will only come into service should a fall occur.

The following are the components:

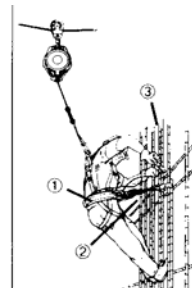
1. Personal Protective Gear: **Full Body Harness**
2. Connecting Device: **Shock-Absorbing Lanyard**
3. Anchor Point: **Eye Bolt/Beam**

A full body harness distributes the forces throughout the body should a fall occur, thus reducing the chances of internal injuries. The shock-absorbing lanyard dramatically decreases the total fall arresting forces, and is designed to soften the impact on the worker.

The third component of the system is the attachment point, which must be capable of supporting 5,000 pounds per worker. This type of fall arrest system must be used whenever there is a danger of falling.

Positioning

The second category is the personal positioning system, which holds a worker in place while allowing a hands-free-working environment. Whenever a worker leans back, the system is activated, making this an "active" system. The following is an example of a widely used positioning system:



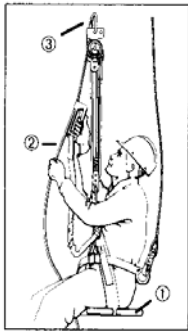
1. Personal Protective Gear: **Full Body Harness**
2. Connecting Device: **Rebar Chain Assembly**

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3. Anchor Point: **Vertical Rods**

Note that a fall arrest system is used in conjunction with the personal positioning system. We urge the use of the combination system whenever possible, because a personal positioning system is not designed for fall arrest purposes. By using this combination system, the fall arrest components will be activated should the worker suffer a fall while working or changing work positions.

Suspension



These systems are widely used. They are designed to lower and support a worker while allowing a hands-free work environment. The components of a suspension system typically are:

1. Personal Protective Gear: **Bos'n Chair**
2. Connecting Device: **Workable**
3. Anchor Point: **Anchor Bolt/Carabineer**

Because the suspension system components are not designed to arrest a free fall, a back-up fall arrest system should be used in conjunction with the personal suspension system. This fall arrest system will only activate should the worker experience a free fall.

Retrieval

The fourth category of the system is mostly used in confined space, and is known as a personal retrieval system. This system is primarily used where workers must be lowered into tanks, manholes, etc., and may require retrieval from above should an emergency occur. The following shows a typical personal retrieval system:

1. Personal Protective Gear: **Full Body Harness**
2. Connecting Device: **Retractable Lifeline/Rescue Unit**
3. Anchor Point: **Tripod Eyebolt**

Safety and Use Instructions

Body Wear

1. Visually check all buckles to assure proper and secure connections before each use.

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2. Fall protection connecting devices should be attached to the back Dee ring of a full body harness or body belt.
3. Never attach non-locking snaps to a Dee ring.
4. Side, front, and chest dee rings should be used for positioning only.
5. Shoulder Dee rings should be used for retrieval only.

Connecting Devices

1. Use only lanyards containing locking snap hooks.

2. Always visually check that each snap hook freely engages the Dee ring or anchor point, and that its keeper is completely closed.

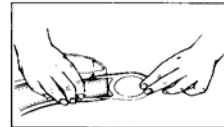


Fig. 2

3. Tie-off in a manner that limits free fall to the shortest possible distance, (six feet maximum).

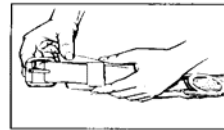


Fig. 3

4. Shock absorbers can elongate up to 3-1/2 feet. This elongation distance must be considered when choosing a tie-off point.

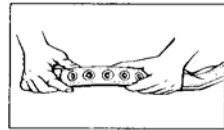


Fig. 4

5. Tie-off in a manner, which ensures a lower level, and will not be struck should a fall occur.

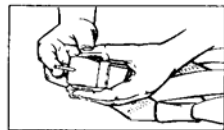


Fig. 5

6. Do not tie knots in lanyards.

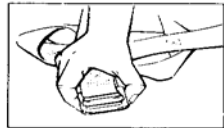


Fig. 6

7. Never disable locking keeper or alter connecting device in any way.

8. Do not attach multiple lanyards together, or attach a lanyard back onto itself.

9. Do not wrap lanyards around sharp or rough edges. Use a cross arm strap to wrap around surface and connect to lanyard snap hook. For extremely sharp surfaces, use a wear pad to protect strap from damage.

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10. Do not allow rope or webbing to come in contact with high temperature surfaces, welding, or other heat sources.
11. The use of shock absorbers is highly recommended to reduce fall arresting forces.
12. Never use natural materials (manila, cotton, etc.) as part of a fall protection system.
13. Do not tie-off into an object, which is not compatible with lanyard snap hooks.
14. Make sure snap hook is positioned so that its keeper is never load bearing.

Anchor Points

1. Anchor point must be capable of supporting 5,000 pounds per worker.
2. Always work directly under the anchor point to avoid a swing-fall injury.
3. Never wrap lanyards around sharp or rough anchor points. Use a cross arm strap for wrapping around the surface and connect lanyard snap hook to strap.
4. Ensure that the anchor point is at a height that limits free-fall distance to six feet or less.
5. The anchor point must be compatible with the snap hook and must not be capable of causing a load to be applied to snap hook keeper.
6. Ensure that the anchor point is at a level that will not allow a lower level to be struck should a fall occur.
7. When selecting an anchorage point, always remember that shock absorbers may elongate up to 3-1/2 feet.
8. Never use an anchor point, which will not allow snap hook keeper to close.

Visual inspection before each use is mandatory and is just good common sense. Regular inspection by a competent person for wear, damage or corrosion is a required part of your safety program. Inspect your equipment

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daily, and replace it if any of the defective conditions explained in this manual are found.

Inspection and Care

Body Belt/Harness Inspection

For harness inspection, perform the following procedures for all harness straps:

1. **Belts and rings:** Beginning at one end, holding the body side of the belt toward you, grasp the belt with your hands 6 to 8 inches apart. Bend the belt in an inverted "U" as shown (Fig. 1). The surface tension resulting makes damaged fibers or cuts easier to see. Follow this procedure the entire length of the belt or harness. Watch for frayed edges, broken fibers, pulled stitches, cuts or chemical damage.

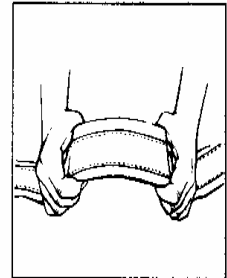


Fig. 1

- a. Check Dee rings and Dee ring metal wear pad (if any) for distortion, cracks, breaks, and rough or sharp edges.

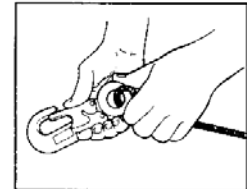


Fig. 7

(Fig. 2). The Dee ring bar should be at a 90° angle with the long axis of the belt, and should pivot freely.

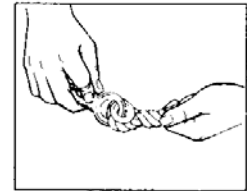


Fig. 8

- b. Attachments of buckles and Dee rings should be given special attention. Note any unusual wear, frayed or cut fibers, or distortion of the buckles or does.

- c. Inspect for frayed or broken strands. Broken webbing strands generally appear as tufts on the webbing surface. Any broken, cut or burned stitches will be readily seen.

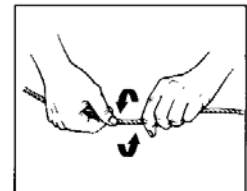


Fig. 9

- d. The tongue, or billet of the belts, receives heavy wear from repeated buckling and unbuckling. Inspect for loose, distorted or broken grommets (Fig. 4). Belts should not have additional punched holes.

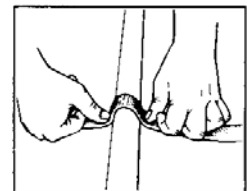


Fig. 10

2. **Tongue Buckle:** Buckle tongues should be free of distortion in shape and motion. They should overlap the buckle frame and move freely back and forth in their socket. Roller should turn freely on frame. Check for distortion or sharp edges (Fig. 5).

3. **Friction and Mating Buckles:** Inspect the buckle for distortion. The outer bars and center bars must be straight. Pay special attention to corners and attachment points of the center bar (Fig. 6).

Lanyard Inspection

When inspecting lanyards, begin at one end and work to the opposite end. Slowly rotate the lanyard so that the entire circumference is checked. Spliced ends require particular attention. Hardware should be examined under procedures as detailed below, i.e., snaps, Dee ring and thimbles.

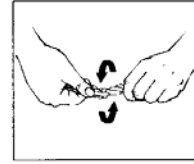


Fig. 11

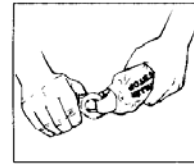


Fig. 12

1. Hardware

a. Snaps: Inspect closely for hook and eye distortions, cracks, corrosion, or pitted surfaces. The keeper (latch) should seat into the nose without binding and should not be distorted or obstructed (Fig. 7). The keeper spring should exert sufficient force to firmly close the keeper. Keeper locks must prevent the keeper from opening when the keeper closes.

b. Thimbles: The thimble must be firmly seated in the eye of the splice, and the splice should have no loose or cut strands. The edges of the thimble must be free of sharp edges, distortion, or cracks (Fig. 8).

2. **Steel Lanyard:** While rotating the steel lanyard, watch for cuts, frayed areas, or unusual wearing patterns on the wire (Fig. 9). Broken strands will separate from the body of the lanyard.

3. **Web Lanyard:** While bending webbing over a pipe or mandrel, observe each side of the webbed lanyard (Fig. 10). This will reveal any cuts or breaks. Swelling, discoloration, cracks and charring are obvious signs of chemical or heat damage. Observe closely for any breaks in the stitching.

4. **Rope Lanyard:** Rotation of the rope lanyard while inspecting from end-to-end will bring to light any fuzzy, worn, broken or cut fibers (Fig. 11). Weakened areas from extreme loads will appear as a noticeable change in original diameter. The rope diameter should be uniform throughout, following a short break-in period.

5. **Sofstops:** The outer portion of the pack should be examined for burn holes and tears (Fig. 12). Stitching on areas where the pack is sewn to Dee rings, belts, or lanyards should be examined for loose strands, fins and deterioration.

**VISUAL INDICATIONS OF DAMAGE
TO WEBBING AND LANYARDS**

Type of Webbing	Heat	Chemical	Molten Metal or Flame	Paint and Solvents
Nylon & Cordura	In excessive heat, nylon becomes brittle and has a shriveled brownish appearance. Fibers will break when flexed. Should not be used above 200°F.	Change in color usually appearing as a brownish smear or smudge. Transverse cracks when belt is bent over a mandrel. Loss of elasticity in belt.	Webbing strands fuse together. Hard shiny spots. Hard and brittle feel. Will not support combustion.	Paint which penetrates and dries restricts movement of fibers. Drying agents and solvents in some paints will appear as chemical damage.
Polyester (Dacron*)	Same as nylon, except do not use above 180°F.	Same as nylon.	Same as nylon, except will support combustion.	Same as nylon.

*Note: Lanyards made of nylon rope will show the same visual indications of damage as nylon webbing. Likewise, lanyards made of polyester rope will show the same visual indications of damage as polyester webbing. *Du Pont trademark.*

Basic care of all safety equipment will prolong the durable life of the unit and will contribute toward the performance of its vital safety function. Proper storage and maintenance after use are as important as cleansing the equipment of dirt, corrosives, or contaminants. Storage areas should be clean, dry and free of exposure to fumes or corrosive elements.

Cleaning and Storage

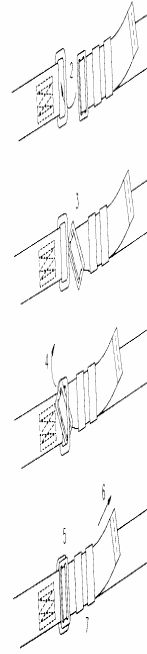
1. Nylon and Polyester: Wipe off all surface dirt with a sponge dampened in plain water. Squeeze the sponge dry. Dip the sponge in a mild solution of water and commercial soap or detergent. Work up a thick lather, using a vigorous back and forth motion. Then wipe the belt dry with a clean cloth. Hang freely to dry, but away from excessive heat.
2. Drying Belts and other equipment should dry thoroughly without close exposure to heat, steam, or long periods of sunlight.

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Mating Buckle Connection Instructions

Check that the straps are not twisted. The loose end of webbing is for adjustment and must always be located on the outside, away from the user.

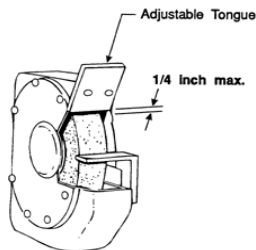
1. The buckle with the center bar must pass **under** the square link.
2. Turn the center bar buckle so that the narrow side can pass **under and through** the square link.
3. Pull the center bar buckle completely through the square link.
4. Allow the center bar buckle to fall into place on top of the square link.
5. Pull loose end of strap to tighten adjustment of the harness.
6. Slide keepers to hold any excess webbing.
7. To remove, reverse procedure.



Abrasive Wheel Grinders

2/10/2001

Policy



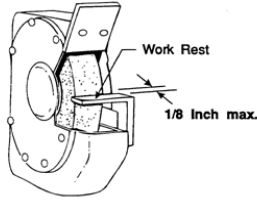
The bench grinder is one of the most useful power tools we have, but it must be kept properly adjusted. You may not, under any circumstance, move the guards or end caps. If the work cannot be done with the work rest in place, do not use this tool. You must adjust the guards before and after you use the bench grinder. Leaving the bench grinder guards with spaces greater than 1/8" and 1/4" is a violation of company policy and will result in disciplinary action.

Safe Practices

Cleanliness must always be maintained around grinders.

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The work rest on grinders must be used and kept to within 1/8 inch of the wheel. The adjustable tongue on the topside of a grinder must be used and kept to within 1/4 inch of the wheel. Side guards on grinders must cover the spindle, nut, flange and 75% of the wheel diameter.



Bench and pedestal grinders must be permanently mounted before being used. They must be connected to their electrical supply system with metallic conduit or other permanent wiring.

Goggles or face shields will be worn when grinding.

Before new abrasive wheels are mounted, they must be visually inspected and ring tested.

Dust collectors and powered exhausts provided on grinders must be used in operations that produce dust.

Splashguards mounted on grinders that use coolant must be used to prevent the coolant from reaching the operator

Compressed Gas Cylinders

09/26/98

Policy

All compressed gas must be handled with extreme caution. The danger cannot be understated. All compressed gas must have the safety cap in place at all times, except when in use. Only trained personnel will move or handle this material. All compressed gas cylinders must be restrained at all times. Violation of this policy may result in disciplinary action, up to and including termination. You must not move, replace, adjust, or in any way have a compressed gas cylinder unrestrained. The following example will serve to emphasize this policy.

Safe Practices

- When you change an empty cylinder, first remove any regulator or valve. Put the safety cap on and secure the cap in place. Remove the restraining chain, strap or cage. Remove the cylinder, put it in the empty bin or storage area, and restrain the empty cylinder. Now take the new cylinder and put into the cart, bin or production platform.

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Remove the safety cap only when the cylinder is restrained and secured in place. Attach the regulator or valve and put the refilled unit into service.

- Cylinders must be legibly marked to clearly identify the gas contained.
- Compressed gas cylinders must be stored in areas that are protected from external heat sources such as flame impingement, intense radiant heat, electric arcs, or high temperature lines. They must be located or stored in areas where they will not be damaged by passing or falling objects, or will not be subject to tampering by unauthorized persons. They must be stored or transported in a manner to prevent them from creating a hazard by tipping, falling, or rolling.
- Cylinders containing liquefied fuel gas must be stored or transported in a position so that the safety relief device is always in direct contact with the vapor space in the cylinder.
- All valves must be closed off before a cylinder is moved, when the cylinder is empty, and at the completion of each job. Valve protectors always must be placed on cylinders when the cylinders are not in use or connected for use.
- Low pressure fuel-gas cylinders must be checked periodically for corrosion, general distortion, cracks, or any other defect that might show a weakness or make it unfit for service. The periodic check must include a close inspection of the cylinder's bottom.

Propane Safety

INTRODUCTION



Propane, also called liquid petroleum gas (or LPG), is a very useful material. Millions of gallons are used safely every day for a variety of purposes. We use propane as a fuel for forklifts. We use propane to cook food on our barbecues, as well as a source for heat, and cooling and cooking in our recreational vehicles. Propane is also commonly used as a home heating and cooking fuel in rural areas where natural gas lines are difficult to construct. Additionally propane is used as a propellant for aerosol cans; because the propane is pressurized, it is able to propel material such as paint or cleaners out of the cans.

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However, propane is a hazardous material. While propane is handled safely every day, it can be a dangerous product when handled incorrectly. Understanding all the properties and safety procedures for propane is crucial for protecting yourself and those around you.

PROPERTIES OF PROPANE AND SAFETY PROCEDURES

Propane has several properties, which make it a hazardous material. Firstly, propane is highly flammable. Therefore, it must be kept away from flames, fires, smoking, or other sources of ignition. In addition, since propane is stored under pressure in cylinders or tanks, the possibility of explosion exists if fire, or spark is present. Grounding of tanks is essential in order to eliminate the build up of static electricity, which is also a potential source of ignition. That is why tools such as wrenches used on tank fittings and pipes must be non-sparking.

Propane is an extremely cold material. Exposure to the skin will cause the same type of burns as exposure to fire. Second and third degree burns can result from contact with unprotected skin. Therefore, personal protective equipment must be worn whenever propane is handled. This includes the filling of tanks and the connecting and disconnecting of lines. Protective equipment must include a minimum of gloves and safety glasses.



Breathing propane vapors is irritating and will cause dizziness or asphyxiation. So propane must always be used outside or where there is adequate ventilation. Because propane vapors are heavier than air and will spread along the ground, ventilation systems must allow for evacuation of vapors from low areas such as sewers, basements, or the bottom of tanks. Enclosed areas must be equipped with LPG gas detectors in addition to adequate ventilation.

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LEAKS

Checking for leaks from propane tanks on forklifts, recreational vehicles, barbecues, or bulk tanks is terribly important. Leaks from tanks or lines are very dangerous. Equipment, machinery, or vehicles should never be operated when leaks are present.

There are several ways to check for leaks. The first is by the sense of smell. Propane is actually odorless. However, odor is added to help us detect leaks. Yet, using **only** our sense of smell is not very reliable because as during warmer weather you will smell some propane anyway: Heat expands the propane and some of the material will be released through a relief valve that is required on all tanks.

Applying soapy water around fittings or hoses can detect leaks, as a leak will cause the soapy water to bubble. In addition, you can check visually for propane icing around hoses and fittings. Remember not to touch the iced areas without gloves.

Propane detectors are common, accurate, and inexpensive. There are a variety of types, which can be used in many different situations. Anytime a leak is detected by these methods, equipment must not be used until the leak is repaired and all hoses and fitting are tightly secured.

EMERGENCY RESPONSE

Listed below are specific guidelines for fire, leak response, and first aid. Personnel who handle propane must know all of these procedures.

FIRE

DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS THE LEAK CAN BE STOPPED.

- **Small Fires**
 - Use dry chemical or CO 2.
- **Large Fires**
 - Use water spray or fog.
 - Move containers from any fire area if you can do so without risk.
- **Fire involving Tanks**

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- Fight tank fires from maximum distance, using unmanned hose holders, or monitor nozzles.
- Cool containers by flooding with large quantities of water until well after fire is exterminated.
- Do not direct water at the source of leak or at safety devices, as icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices, or from discoloration of tank.
- ALWAYS stay well away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders, or monitor nozzles, if this is impossible withdraw immediately from the area and let the fire burn.

SPILL OR LEAKS

- Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do so without risk.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- Prevent spreading of vapors through sewers, ventilation systems and confined areas.
- Isolate area until gas has dispersed.

CAUTION: When in contact with refrigerated/cryogenic liquids like propane, many materials become brittle and are likely to break without warning.

- **First Aid**
 - Move victim to fresh air.
 - Call 911 or emergency medical service.
 - Administer oxygen if breathing is difficult.
 - Apply artificial respiration if victim is not breathing.
 - Remove and isolate contaminated clothing and shoes.
 - Clothing frozen to the skin should be thawed before removal.
 - In case of physical contact with liquefied gas, thaw injured parts with lukewarm water.
 - Keep victim warm and quiet.

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INC.**

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

REMEMBER

Propane is a common and useful chemical.

But it must be handled with great care.

**Following ALL safety procedures will ensure your
safety!**



Air Compressors and Receivers

11/30/99

Policy

We will only use air compressors that are rated and inspected as required by law. If the compressor does not have a posted permit, you are not permitted to operate the compressor. You are required to inform management that the permit is missing. Only trained and authorized personnel will be permitted to repair or maintain this equipment.

Safe Practices

- Compressors must have pressure relief valves and pressure gauges.
- Compressor air intakes must be installed and equipped to assure that only clean uncontaminated air enters the compressor. Air filters must be installed on the compressor intake.
- Safety devices on compressed air systems must be checked frequently; compressors must be operated and lubricated according to the manufacturer's recommendations.
- Before any repair work is done on the pressure system of a compressor, the pressure must be bled off, and the system locked-out.
- Signs posted to warn of the automatic starting feature of compressors must not be removed or blocked from view.
- The belt drive system of compressors must be enclosed, to provide protection for the front, back, top, and sides.
- It is strictly prohibited to direct compressed air towards a person.
- Highly compressed air may not be used for cleaning. If compressed air is used for cleaning off clothing, the pressure must be reduced to less than 10 psi. When using compressed air for cleaning, employees must wear protective chip guarding and personal protective equipment. It is prohibited to use compressed air to clean up or move combustible dust, if such action could cause the dust to be suspended in the air and cause a fire or explosion hazard.
- Safety chains or other suitable locking devices must be used at couplings of high-pressure hose lines where a connection failure would create a hazard.

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- Before compressed air is used to empty containers of liquid, the safe working pressure of the container must be checked.
- When compressed air is used with abrasive blast cleaning equipment, the operating valve must be of a type that is manually held open.
- When compressed air is used to inflate auto tires, a clip-on chuck and an inline regulator preset to 40 psi is required.
- When compressed air is used to power nail guns the pressure must be set under 100 psi.
- The inlet of air receivers and piping systems must be kept free of collected oil and carbonaceous materials.

Powder Activated Tools

Policy

Only approved powder-actuated tools shall be used. Only approved and qualified employees who carry valid operators cards for the tools being used will be allowed to operate powder-actuated tools. The cards shall be issued by the tool manufacturer or a qualified instructor.

Safe Practices

1. Tools shall be operated in accordance with the manufacturers instructions.
2. Eye and Face protection must be worn by the operator and assistants when the tool is in use.
3. The tool shall be inspected and serviced before each shift. All required repairs shall be made before the tools can be used. If the tool can not be repaired, the tool will be tagged "Defective" and put out of service. A record of this inspection and service shall be noted and dated on the tool inspection record.
4. The shield, fixture, or accessory suited for the application as recommended and supplied by the manufacturer will be used.
5. Only fasteners and power loads recommended by the tool manufacturer for a particular tool, or those providing the same level of safety and performance are to be used.
6. Tools shall not be loaded until just prior to the intended firing time.
7. If work is interrupted after loading the tool. The tool shall be unloaded immediately.
8. Never point a loaded or unloaded tool at any person.
9. Keep hands and feet clear of the open barrel end.
10. The tool shall always be held perpendicular to the work surface when fastening into any material, except for specific applications recommended by the tool manufacturer.

11. In the event of a misfire, the operator shall hold the tool firmly against the work surface for a period of 30 seconds and then follow the instruction set forth in the manufacturer's instructions.
12. Power loads of different power levels and types must be kept in separate compartments or containers.
13. A sign at least 8" X 10" (20x25 mm). using boldface type no less than 1" (2.5 cm) in height, be conspicuously posted within 50' (15m) of the area where the tools are being used. The sign shall bear the wording similar to the following:

Caution

Powder-Actuated Tools in Use

14. All power actuated tools shall be kept in lockable containers and shall be labeled with the words "Warning Power-Actuated Tool to be used Only by a Qualified Operator and to be kept under lock and Key when not in Use"
15. Powder-actuated tools and power loads shall be locked in a container and stored in a safe place when not in use and shall be accessible only to authorized personnel.
16. Each tool shall have an operator instruction and service manual, power load and fastener chart, tool inspection and service record, service tools and accessories.
17. Only approved pole tool assemblies shall be used.
18. The tool shall not be used in an explosive or flammable atmosphere.
19. A loaded tool shall never be left unattended.
20. Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tile, hardened steel, and glass block.
21. Fasteners shall not be driven into easily penetrated or thin materials or materials of questionable resistance unless backed by a material that will prevent the fastener from passing completely through the other side.
22. Fasteners shall not be driven closer than ½ inch (13 mm) from the edge of steel except for specific applications recommended by the tool manufacturer.

- 23. Fasteners shall not be driven closer than 3 inches (76 mm) from the unsupported edge of masonry materials except for specific application recommended the tool manufacture.
- 24. Fasteners shall not be driven into concrete unless material thickness is at least three times the fastener shank penetration.
- 25. Fasteners shall not be driven into any spalled area.
- 26. Fasteners shall not be driven through existing holes unless a specific guide means, as recommended and supplied by the tool manufacturer, is used to assure positive alignment.

Portable Floor Space Heaters

3/5/2001

Policy:

You may not bring a heater into your office space without permission from your supervisor or manager. Only trip or fall protected heaters can be used.

Safe Practices:

- Caution: A heater is hot when in use. To avoid burns, do not let bare skin touch hot surfaces.
- Caution: Keep combustible materials such as furniture, pillows, bedding, papers, boxes, clothes, purse's or any other material at least 3 feet from the heater.
- Allow heater to cool before moving.
- You must not leave the heater unattended under any condition.
- Always unplug the heater when not in use.
- Do not operate the heater with a damaged cord or plug.
- You may not have or use a heater in the bathroom unless; the heater is specifically designed and built for this purpose. Keep all heaters away from all moisture and water.
- Do not operate the heater after the heater malfunctions, or has been dropped or damaged in any manner.
- Do not run the power cord under carpeting, mats, throw rugs, runners, or floor mats. Arrange cord away from traffic areas and where it will not be tripped over.
- To disconnect heater, set control to **OFF**, then remove plug from power outlet.
- The heater must only be used in an upright position.
- Do not use this heater in areas where gasoline, paint, or other flammable liquids are used or stored.
- Do not use an extension cord, this may cause the extension cord to overheat and create a fire risk.
- Keep the heater clean. **DO NOT** allow foreign objects to enter any ventilation or exhaust opening as this may cause electric shock, fire, or damage the heater.
- Do not plug this heater into a plug strip or an outlet that has other electrical appliances plugged in it. This may overload the circuit and create a fire hazard.

Bobcat Operation:

9/24/00

Policy

Only trained and authorized employees can operate the Bobcat Loader. Employees must have passed the operator training course. A valid operators license must be in the employee's possession at all times.

Safe Practices:

Employees must read and understand the written instructions, outlining the operations of this equipment.

Employees must have been trained, with the actual equipment in operation.

Know the work conditions for each material and operation.

Do not exceed the rated capacity of the loader.

Avoid excessive slopes.

Eye protection must be worn at all times when operating this equipment.

This equipment has a gas combustion engine, avoid prolonged use in confined or indoor areas.

The engine will get hot when used; avoid combustible materials.

Never remove caution or danger signs from the equipment.

The Bobcat Loader must be inspected before each use and shift.

The engine compartment must be inspected before each shift.

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Power Washers

1/22/05

Policy

The policy of Environmental Products & Applications, Inc. concerning power washers is that extreme care must be used at all times. Many of us tend to think that water is not dangerous, but with this tool it surely can be. Only trained personnel may use this tool. You will never direct the water flow towards another employee.

Safe Practices

- Great care must be used whenever this equipment is used.
- Only authorized personnel may use this equipment.
- Only employees that have been trained on the use and maintenance of this equipment may use this machine.
- You must not point this equipment towards any person, at any time.
- You are required to ensure that the path of the pressure washer and the liquid wash is not directed towards any person or object to which this process may cause damage.

Material Handling

09/25/97

Policy

All employees will follow all of the safety rules regarding the movement of materials. We will follow the safety rules as outlined in the manufacturers information. Only trained and authorized employees may use this equipment.

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Safe Practices

- Motorized vehicles and mechanized equipment used for loading, moving, and unloading material must be inspected daily before its first use.
- Vehicles will be shut off and brakes set before loading or unloading.
- Containers of combustibles or flammables, when stacked while being moved, will always be separated by Dunn age, enough to provide stability.
- Dock boards (bridge plates) must be used when loading or unloading operations are taking place between vehicles and docks.
- Trucks and trailers must be secured from movement during loading and unloading operations.
- Pallets will be inspected before being loaded or moved.
- Hooks with safety latches, or other arrangements, will be used when hoisting materials, so that slings or load attachments will not accidentally slip off the hoist hooks.
- Securing chains, ropes, chokers, or slings must be adequate for the job to be performed.
- When hoisting material or equipment, provisions must be made to assure that no one will be passing under the suspended loads.

Forklifts

11/30/99

Policy

We will follow the rules and regulations as referenced in Title 8, CAL/OSHA's rules and regulations. Only trained and certified drivers will operate this equipment.

Safe Practices

- Only those employees who have been trained in the proper use of forklifts are authorized to operate them.

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- Forklifts must be inspected daily and any problems must be corrected before operation. Refueling or recharging must occur in designated areas only.
- If a forklift does not have adequate overhead protection, a hard hat must be used.
- Forklifts must never be loaded beyond their rated capacity. Loads will be kept low and balanced, with the mast tilted slightly back; wide loads must be centered. Loads will not be raised or lowered while the forklift is moving and a load must not be so tall that it can cause the forklift to tip over. If traveling on inclines, the load must be on the uphill side. If a load blocks the view of the operator, driving will be in reverse. When unloading, the operator will back out slowly, checking for traffic or obstacles. When traveling unloaded, the forks will be lowered.
- Passengers must never be lifted or carried unless the forklift has an approved man-lift device. No one will be allowed to walk under raised forks, whether loaded or unloaded.
- When not in use, forklifts will be parked on flat surfaces with the forks lowered and flattened. The parking brake must be set. If parked on a slope, the wheels must be blocked.

Fork Lift Safety Rules (Title 8 Regulations)

(a) Every employer using industrial trucks or industrial tow tractors, shall post and enforce a set of operating rules including the appropriate rules listed below:

(1) Only drivers authorized by the employer, and trained in the safe operations of industrial trucks or industrial tow tractors, shall be permitted to operate such vehicles. Methods shall be devised to train operators in safe operation of powered industrial trucks.

(2) Stunt driving and horseplay are prohibited.

(3) No riders shall be permitted on vehicles unless provided with adequate riding facilities.

(4) Employees shall not ride on the forks of lift trucks.

(5) Employees shall not place any part of their bodies outside the running lines of an industrial truck, or between mast uprights or other parts of the truck where shear or crushing hazards exist.

(6) Employees shall not be allowed to stand, pass, or work under the elevated portion of any industrial truck, loaded or empty, unless it is effectively blocked to prevent it from falling.

(7) Drivers shall check the vehicle at least once per shift, and if it is found to be unsafe, the matter shall be reported immediately to a foreman or mechanic, and the vehicle shall not be put in service again until it has been made safe. Attention shall be given to the proper functioning of tires, horn, lights, battery, controller, brakes, steering mechanism, cooling system, and the lift system for fork lifts (forks, chains, cable, and limit switches).

(8) No truck shall be operated with a leak in the fuel system.

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(9) Vehicles shall not exceed the authorized or safe speed, and must always maintain a safe distance from other vehicles, keeping the truck under positive control at all times. All established traffic regulations should be observed. For trucks traveling in the same direction, a safe distance may be considered to be approximately three truck lengths, or preferably, a time lapse--3 seconds--passing the same point.

(10) Trucks traveling in the same direction shall not be passed at intersections, blind spots, or dangerous locations.

(11) The driver shall slow down and sound the horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view, the driver shall be required to travel with the load trailing.

(12) Operators shall look in the direction of travel and shall not move a vehicle until certain that all persons are in the clear.

(13) Trucks shall not be driven up to anyone standing in front of a bench or other fixed object of such size that the person could be caught between the truck and object.

(14) Grades shall be ascended or descended slowly.

(A) When ascending or descending grades in excess of 10 percent, loaded trucks shall be driven with the load upgrade.

(B) On all grades the load and load engaging means shall be tilted back, if applicable, and raised only as far as necessary to clear the road surface.

(C) Motorized hand and hand/rider trucks shall be operated on all grades with the load-engaging means downgrade.

(15) The forks shall always be carried as low as possible, consistent with safe operations.

(16) When leaving a vehicle unattended, either:

(A) The power shall be shut off, brakes set, the mast brought to the vertical position, and forks left in the down position. When left on an incline, the wheels shall be blocked; or

(B) The power may remain on provided the brakes are set, the mast is brought to the vertical position, forks are left in the down position, and the wheels shall be blocked, front and rear.

NOTE: When the operator is over 25 feet (7.6 meters) from, or out of sight of the industrial truck, the vehicle is unattended.

(17) When the operator of an industrial truck is dismounted and within 25 feet (7.6 meters) of the truck which remains in the operator's view, the load engaging means shall be fully lowered, controls placed in neutral, and the brakes set to prevent movement.

EXCEPTION: Forks on fork-equipped industrial trucks may be in the raised position for loading and unloading if the forks are raised no more than 42 inches above the level where the operator/loaders are standing, and the power is shut off, controls placed in neutral and the brakes set. If on an incline, the wheels shall be blocked.

(18) Vehicles shall not be run onto any elevator unless the driver is specifically authorized to do so. Before entering an elevator, the driver shall determine that the capacity of the elevator will not be exceeded. Once on an elevator, the power shall be shut off and the brakes set.

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(19) Motorized hand trucks shall enter elevators or other confined areas with the load end forward.

(20) Vehicles shall not be operated on floors, sidewalk doors, or platforms that will not safely support the loaded vehicle.

(21) Prior to driving onto trucks, trailers and railroad cars, their flooring shall be checked for breaks and other structural weaknesses.

(22) Vehicles shall not be driven in and out of highway trucks and trailers at loading docks, until such trucks or trailers are securely blocked or restrained and the brakes set.

(23) To prevent railroad cars from moving during loading or unloading operations, the car brakes shall be set, wheel chocks or other recognized positive stops used, and blue flags or lights displayed in accordance with applicable regulations promulgated by the Public Utilities Commission.

(24) The width of one tire on the powered industrial truck shall be the minimum distance maintained from the edge by the truck while it is on any elevated dock, platform, freight car or truck.

(25) Railroad tracks shall be crossed diagonally, wherever possible. Parking closer than 8 1/2 feet from the centerline of railroad tracks is prohibited.

(26) Trucks shall not be loaded in excess of their rated capacity.

(27) A loaded vehicle shall not be moved until the load is safe and secure.

(28) Extreme care shall be taken when tilting loads. Tilting forward with the load engaging means elevated shall be prohibited except when picking up a load. Elevated loads shall not be tilted forward except when the load is being deposited onto a storage rack or equivalent. When stacking or tiering, backward tilt shall be limited to that necessary to stabilize the load.

(29) The load-engaging device shall be placed in such a manner that the load will be securely held or supported.

(30) Special precautions shall be taken in the securing and handling of loads by trucks equipped with attachments, and during the operation of these trucks after the loads have been removed.

(31) When powered industrial trucks are used to open and close doors, the following provisions shall be complied with:

(A) A device specifically designed for opening or closing doors shall be attached to the truck.

(B) The force applied by the device to the door shall be applied parallel to the direction of travel of the door.

(C) The entire door opening operation shall be in full view of the operator.

(D) The truck operator and other employees shall be clear of the area where the door might fall while being opened.

(32) If loads are lifted by two or more trucks working in unison, the total weight of the load shall not exceed the combined rated lifting capacity of all trucks involved.

(b) Every employee who operates an agricultural or industrial tractor shall be instructed in the following procedures and in any other practices dictated by the work environment. Such information shall be provided at the time of initial assignment and at least annually thereafter. Copies of these instructions, printed in a language understood

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by the majority of the employees, shall be conspicuously posted at a place frequented by the drivers.

Employee Operating Instructions

1. Securely fasten your seat belt if the tractor has a ROPS.
Where possible, avoid operating the tractor near ditches, embankments, and holes.
Reduce speed when turning, crossing slopes, and on rough, slick, or muddy surfaces.
2. Stay off slopes too steep for safe operation.

Watch where you are going, especially at row ends, on roads, and around trees.

Do not permit others to ride.

Operate the tractor smoothly--no jerky turns, starts, or stops.

Hitch only to the drawbar and hitch points recommended by tractor manufacturers.

When tractor is stopped, set brakes securely and use park lock if available.

- (a) Every employee who operates an agricultural or industrial tractor shall be required to check the tractor prior to operation each day, and if it is unsafe, report the matter immediately to a foreman or mechanic and do not use the tractor again until it has been made safe.

Employees shall be prohibited from stunt driving or horseplay while operating an agricultural or industrial tractor.

No repairs shall be performed on any agricultural or industrial trucks or tractors until arrangements have been made to reduce the probability of injury to repairmen or others, caused by sudden movement or operation of such equipment or its parts.

Hoists and Lifts

11/30/99

Policy

Lifts and hoists are one of the most useful tools in handling autos and other large heavy objects. You are required to inspect and test your lift or hoist at the beginning of your shift. If any leaking or loss of fluid or position is observed you must not use the lift or hoist.

Safe Practices

- Only those employees who have been trained in the proper use of hoists and lifts are allowed to operate them.
- Stops provided at the safe limits of travel must be kept in place. Controls must be plainly marked to show the direction of travel or motion. The rated load of each hoist or lift must be legibly marked, visible to the operator, and never exceeded.
- Vehicles must not be raised on a lift while passengers are inside.
- All hoist chains, cables, or ropes must be of enough length to handle the full range of movement for the application while still maintaining two full wraps on the drum, always.
- The hoist chain, cable, or rope must never be wrapped around the load as a substitute for a sling. Slings must not be kinked or twisted.
- Carrying loads over people with a hoist is not permitted.

BATTERIES AND BATTERY CHARGING

1. Batteries of the non-sealed type shall be stored in enclosures with outside vents or in well-ventilated rooms and be so arranged as to prevent the escape of fumes, gases, or electrolyte spray into other areas.
2. Ventilation shall be provided to ensure diffusion of battery gases to prevent the

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accumulation of an explosive mixture.

3. Battery storage and handling.

- a. Racks and trays shall be substantial and shall be treated to make them resistant to the electrolyte.
- b. Floors shall be of acid resistant construction or protected from accumulation of acid.
- c. Facilities for quick drenching of the eyes and body shall be provided for emergency use within 7.5 m (25 ft) of battery handling areas; PPE shall be used as prescribed.
- d. Facilities shall be provided for flushing and neutralizing spilled electrolyte and for fire protection.

4. Battery charging.

- a. Battery charging installations shall be located in areas designated for that purpose.
- b. Charging apparatus shall be protected from mechanical damage.
- c. When charging batteries, the vent caps shall be kept in place to avoid spray of electrolyte: care shall be taken to assure vent caps are functioning.

Wilkie Ladders, Cherry Pickers or Equivalent

02/04/93

Policy

You may not operate this equipment unless you have been trained on its use and safety features.

Safe Practices

1. This equipment must always be maintained in good condition.
2. You must not use this equipment if you do not feel that the equipment is safe.
3. Know your equipment. Read you owner's manual and follow the instructions.

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4. Guard against electric shock. Ground all electric equipment properly. All equipment must be equipped with three (3) prong electrical cords, or as required by the voltage and phase of the current.
5. Do not ride operator's platform while it is folding either up or down.
6. While working on the ladder you must wear all safety and protective equipment.
7. Failure to wear protective or safety equipment is grounds for discharge.
8. Before starting operations each day you are required to check the following.
 - Cylinder and hinge pins and keepers.
 - Hydraulic leak or damaged hoses.
 - Cable anchors, sheaves, pins, and keepers.
 - Cables for frayed or damaged areas.
 - Exposed electrical wiring for insulation damage.
 - Steel structures for weld cracks or deformation of metal.
 - Any part showing deformation, damage or unusual wear shall be immediately reported to your supervisor or responsible person. You will not use this equipment until inspected by the supervisor or responsible person. Failure to follow this requirement is grounds for dismissal.
9. Equipment will not be used if not in safe operating condition.
10. Position truck in most feasible position.
11. Engage parking brake.
12. Stop Engine.
13. Barricade and mark work area for traffic control.
14. Chock wheels to prevent wheel movement.

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15. Extend outriggers to firm support surfaces.
16. Outriggers shall be extended until truck chassis is partially supported by outriggers.
17. Level vehicle as much as possible.
18. Remember you must wear safety equipment when working on the ladder or on high or dangerous areas.
 - Electrocution Hazard Danger: Maintain safe clearances from electrical power lines and apparatus.
 - You must allow for platform sway, rock, or sag.
 - This ladder does not provide protection from contact with, or proximity to, an electrically charged conductor when you are in contact with, or in proximity to another conductor. This can result in **Death or Serious Injury!!**

Powered Super lifts

11/30/99

Policy

Only properly trained employees can operate a super lift or direct its use.

Safe Practices

- Do not overload. You must observe the maximum load capacity.
- You must not lift personnel.
- The powered super lifts are a material lift only and is not to be used for lifting personnel.
- Make sure surface is level. Use only on a level surface!
- Never stand under the load. Never allow other personnel to stand under the load.
- You must not lean ladders, material or other items against the lift.
- When the unit is loaded or elevated, you must not move it.
- Stay clear of overhead wires and obstructions.
- Center load against back of forks. Do not have the load center farther out from the back of the forks than 13". If the load has greater than 13" load center, call the factory and discuss the problem before using the lift.
- Do not operate the unit on an elevated platform, scaffold, truck bed, or extended surface or support.
- Do not leave the lift unattended with the load raised.
- Inspect the cable before operating. Do not use a powered lift with a worn, frayed, kinked, or otherwise damaged cable.

Power Washers

1/14/02

Policy

The policy of Employee Employer Assistance Programs, Inc. concerning power washers is that extreme care must be used at all times. Many of us tend to think that water is not dangerous, but with this tool it surely can be. Only trained personnel may use this tool. You will never direct the water flow towards another employee.

Safe Practices

- Great care must be used whenever this equipment is used.
- Only authorized personnel may use this equipment.
- Only employees that have been trained on the use and maintenance of this equipment may use this machine.
- You must not point this equipment towards any person, at any time.
- You are required to ensure that the path of the pressure washer and the liquid wash is not directed towards any person or object to which this process may cause damage.
- The operator must wear all protective equipment, eye, face and ear protection as required.

Welding, Cutting and Brazing

11/30/99

Policy

Only trained and authorized employees are permitted to use or operate the welding, cutting and or brazing.

Safe Practices

Only authorized and trained personnel are permitted to use welding, cutting, or brazing equipment.

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Compressed gas cylinders must be regularly examined for obvious signs of defects, deep rusting, or leakage.

Care must be used in the handling and storage of cylinders, safety valves, etc., to prevent damage.

Precautions must be taken to prevent the mixture of air or oxygen with flammable gases, except at a burner or in a standard torch.

Only approved apparatus (torches, regulators, pressure-reducing valves, acetylene generators, manifolds) may be used.

Cylinders must be kept away from sources of heat.

Cylinders must be kept away from elevators, stairs, or gangways.

It is prohibited to use cylinders as rollers or supports.

Empty cylinders must be appropriately marked, and their valves closed.

Cylinders, cylinder valves, couplings, regulators, hoses, and apparatus must be kept free of oily or greasy substances.

Be careful not to drop or strike cylinders.

Unless secured on special trucks, regulators must be removed and valve protection caps put in place before moving cylinders.

Cylinders without fixed hand wheels must have keys, handles, or non-adjustable wrenches on stem valves when in service.

Liquefied gases must be stored and shipped valve-end up with valve covers in place.

A fuel-gas cylinder valve must never be cracked near the source of ignition.

Before a regulator is removed, the valve must be closed, and gas released from the regulator.

Red is used to identify an acetylene (and other fuel-gas) hose, green for the oxygen hose, and black for an inert gas and air hose.

Pressure-reducing regulators must be used only for the gas and pressures for which they are intended.

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The open circuit (no load) voltage of arc welding and cutting machines must be as low as possible and not more than the recommended limits.

Under wet conditions, automatic controls for reducing no load voltage must be used.

The machine frame and safety ground connections of portable welding machines must be checked periodically.

Electrodes must be removed from the holders of welders when not in use.

Electric power to a welder must be shut off when no one is in attendance.

Suitable fire extinguishing equipment must be available for immediate use at the site of welding operations.

Welders may not coil or loop welding electrode cable around their bodies.

Wet welding machines must be thoroughly dried and tested before being used.

Work and electrode lead cables must be frequently inspected for wear and damage, and replaced when needed.

The means for connecting cable lengths must have adequate insulation.

When the object to be welded cannot be moved and fire hazards cannot be removed, shields must be used to confine heat, sparks, and slag.

Firewatchers must be assigned when welding or cutting is performed in locations where a serious fire might develop.

Combustible floors must be kept wet, covered by damp sand, or protected by fire-resistant shields.

When floors are wetted down, procedures must be taken to protect personnel from possible electrical shock.

When welding is done on metal walls, precautions must be taken to protect combustibles on the other side.

Before hot work is begun, used drums, barrels, tanks, and other containers must be so thoroughly cleaned that no substances remain that could explode, ignite, or produce toxic vapors.

Employees exposed to the hazards created by welding, cutting, or brazing operations must be protected with personal protective equipment and clothing. Eye protection

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helmets, hand shields, and goggles that meet appropriate standards must be used during all welding, cutting, and brazing operations.

There must be adequate ventilation in and where welding or cutting is performed.

When working in confined places, environmental monitoring tests must be taken and means provided for quick removal of welders in case of an emergency.

Spot Welder

12/2/99

Policy

All employees will follow the safety rules as outlined in this section. You will not use this equipment without training and the authorization of your supervisor.

Safe Practices

Only authorized and trained personnel may operate the welding unit.

Warning: People who have a heart pacemaker should not use the welding unit.

Warning: People with false teeth must not operate the welder.

Warning: Welding tips and cables may become very hot after a welding operation, when the unit is operated on full weld time and power.

Warning: Welding cables should not be pulled erratically during operation. This may cause the welding unit to become unsteady and topple over.

Warning: If cables or machines should ever come in contact with water, it is important that the machine is immediately disconnected from the main power supply. Then, seek technical advise from a qualified technician.

Before starting to use the machine, check that the power supply is correctly connected.

For good operation, check that the second earth plate is required.

Ensure that the earth plate is correctly on the work surface.

Make sure earth shoe is in full contact, with the prepared surface on the vehicle or work piece.

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If working on a motor vehicle, ensure that the battery, alternator and computer systems are disconnected before starting operation.

Check that there is no flammable materials or items within the operator's working area. Look for petrol tanks, gas tanks or lines.

Check that there are no other employees in the area, who could be in danger, while work is being done.

Always remember to be very careful when you are working at or near the gas tank area of the automobile.

Adequate protective clothing must always be worn when operating this equipment, eye and face protection, gloves and overalls.

Gloves must be worn when welding to avoid handling hot welding tips.

All jewelry must be removed, as the magnetic forces could damage them or cause serious injury to your self or others.

Before removing any covers on this machine, you must disconnect the main power supply. Working or modifying this, or any other machine, is a violation of company policy. You must receive approval from your supervisor before beginning work on this, or any other machine.

When welding any galvanized or zinc coated steels, adequate breathing apparatus must be worn. Please refer to the Respiratory Protection Program.

Entering Confined Spaces

9/3/96

Policy

You must not enter a permit-confined space without a permit and the approval of your supervisor.

Safe Practices

- Before entry, confined spaces must be thoroughly emptied of any corrosive, toxic, hazardous, or flammable substances or gasses.
- All lines to a confined space containing inert, toxic, flammable, or corrosive materials must be valued off and blanked or disconnected and separated before entry.

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- All impellers, agitators, or other moving equipment inside confined spaces must be locked-out if they present a hazard.
- Either natural or mechanical ventilation must be provided before confined space entry. There must be adequate illumination when working inside a confined space.
- When required, there must be an appropriately trained safety standby employee outside the confined space whose sole responsibility is to watch the work in progress, sound an alarm if necessary, and give help.
- All portable electrical equipment used inside confined spaces must be either grounded and insulated, or equipped with ground fault protection.
- Before gas welding or burning is started in a confined space, hoses must be checked for leaks (compressed gas bottles must be kept outside the confined space) and the confined area must be tested for an explosive atmosphere. Torches must be lighted outside the confined area and then taken into the confined space.
- When oxygen-consuming equipment such as salamanders, torches, and furnaces are used in a confined space, enough air must be provided to assure combustion without reducing the oxygen concentration of the atmosphere below approved levels.

Excavations, Trenches, Shoring, Benching, Shafts and other Earthwork

9/3/96

1. **Permits Requirements.** All trenches or excavations which are 5 feet or deeper and into which a person is required to descend must have a permit.
2. **Excavations** are defined to include trenches. Scope and application. This article applies to all open excavations made in the earth's surface.

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3. Surface encumbrances. All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.
4. Underground installations.
 - a) The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.
 - b) All Regional Notification Centers as defined by Government Code Section 4216(a) in the area involved and all known owners of underground facilities in the area who are not members of a Notification Center shall be advised of the proposed work at least 2 working days prior to the start of any digging or excavation work. EXCEPTION: Emergency repair work to underground facilities.
 - c) When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means.
 - d) While the excavation is open, underground installations shall be protected, supported, or removed as necessary to safeguard employees.
5. Access and egress.
 - a) Structural ramps.
 - b) Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person.

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Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

- c) Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement.
 - d) Structural members used for ramps and runways shall be of uniform thickness.
 - e) Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping.
 - f) Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments to the top surface to prevent slipping.
6. Means of egress from trench excavations. A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet or more in depth so as to require no more than 25 feet of lateral travel for employees.
7. Exposure to vehicular traffic. Employees exposed to public vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.
8. Exposure to falling loads. No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped, in accordance with

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Section 1591(e), to provide adequate protection for the operator during loading and unloading operations.

9. Warning system for mobile equipment. When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.
10. Hazardous atmospheres. Testing and controls. In addition to the requirements set forth in the Construction Safety Orders and the General Industry Safety Orders to prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions, the following requirements shall apply.
 - a) Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are stored nearby, the atmospheres in the excavation shall be tested before employees enter excavations greater than 4 feet in depth.
 - b) Adequate precautions shall be taken to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres. These precautions include providing proper respiratory protection or ventilation.
 - c) Adequate precaution shall be taken such as providing ventilation, to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 20 percent of the lower flammable limit of the gas.

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- d) When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.

11. Emergency rescue equipment.

- a) Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.
- b) Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear a harness with a lifeline securely attached to it. The lifeline shall be separate from any line used to handle materials, and shall be individually attended at all times while the employee wearing the lifeline is in the excavation.

12. Protection from hazards associated with water accumulation.

- a) Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.

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- b) If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.
- c) If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require an inspection by a competent person and compliance with Sections 055: (h)(1) and (h)(2).

13. Stability of adjacent structures.

- a) Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.
- b) Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted except when:
- c) A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or
- d) The excavation is in stable rock; or
- e) A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

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- f) Sidewalks, pavements and appurtenant structure shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

14. Protection of employees from loose rock or soil.

- a) Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.
- b) Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

15. Inspection.

- a) Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard-increasing

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occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

- b) Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

B. Fall protection.

- a) Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.
- b) Adequate barrier physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc. shall be barricaded or covered. Upon completion of exploration and other similar operations, temporary wells, pits, shafts, etc., shall be backfilled.

2. Requirements for Protective Systems.

- a) Protection of employees in excavations.
- b) Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with Section 085: or 090: except when:
 - (1) Excavations are made entirely in stable rock; or
 - (2) Excavations are less than 5 feet in depth and examination of the ground by a competent

person provides no indication of a potential cave-in.

- c) Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.
3. Design of sloping and benching systems. The slopes and configurations of sloping and benching systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of Section 085:(1); or, in the alternative, Section 085:(2); or, in the alternative, Section 085:(3); or, in the alternative, Section 085:(4), as follows:
- a) Option (1) - Allowable configurations and slopes.
 - (1) Excavations shall be sloped at an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal), unless the employer uses one of the other options listed below.
 - (2) Slopes specified in Section 085: (1)(a) shall be excavated to form configurations that are in accordance with the slopes shown for Type C soil in Appendix B to this article.
 - b) Option (2) - Determination of slopes and configurations using Appendices A and B. Maximum allowable slopes, and allowable configurations for sloping and benching systems, shall be determined in accordance with the conditions and requirements set forth in Appendices A and B to this article.
 - c) Option (3) - Designs using other tabulated data.

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- d) Designs of sloping or benching systems shall be selected from and be in accordance with tabulated data, such as tables and charts.
- e) The tabulated data shall be in written form and shall include all of the following:
 - (1) Identification of the parameters that affect the selection of a sloping or benching system drawn from such data;
- f) Identification of the limits of use of the data, to include the magnitude and configuration of slopes determined to be safe;
- g) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.
 - (1) At least one copy of the tabulated data, which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Division upon request.
- h) Option (4) - Design by a registered professional engineer.
- i) Sloping and benching systems not utilizing Option (1) or Option (2) or Option (3) under Section 085: shall be approved by a registered professional engineer.
- j) Designs shall be in written form and shall include at least the following:

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- (1) The magnitude of the slopes that were determined to be safe for the particular project;
 - (2) The configurations that were determined to be safe for the particular project;
 - (3) The identity of the registered professional engineer approving the design.
- k) At least one copy of the design shall be maintained at the jobsite while the slope is being constructed. After that time the design need not be at the jobsite, but a copy shall be made available to the Division upon request.
4. Designs of support systems, shield systems, and other protective systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of Section 090:(1); or, in the alternative, Section 090:(2); or, in the alternative, Section 090:(3); or, in the alternative, Section 090:(4) as follows:
 - a) Option (1) - Designs using Appendices A, C and D. Designs for timber shoring in trenches shall be determined in accordance with the conditions and requirements set forth in Appendices A and C to this article. Designs for aluminum hydraulic shoring shall be in accordance with Section 090:(2), but if manufacturer's tabulated data cannot be utilized, designs shall be in accordance with Appendix D.
 - b) Option (2) - Designs Using Manufacturer's Tabulated Data.
 - c) Design of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data shall be in accordance with all specifications,

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recommendations, and limitations issued or made by the manufacturer.

- (1) Deviation from the specifications, recommendations, and limitations issued or made by the manufacturer shall only be allowed after the manufacturer issues specific written approval.
- d) Manufacturer's specifications, recommendations, and limitations, and manufacturer's approval to deviate from the specifications, recommendations, and limitations shall be in written form at the jobsite during construction of the protective system. After that time this data may be stored off the jobsite, but a copy shall be made available to the Division upon request.

5. Option (3) - Designs using other tabulated data.

- a) Designs of support systems, shield systems, or other protective systems shall be selected from and be in accordance with tabulated data, such as tables and charts.
- b) The tabulated data shall be in written form and include all of the following:
- c) Identification of the parameters that affect the selection of a protective system drawn from such data;
- d) Identification of the limits of use of the data;
- e) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.
- f) At least one copy of the tabulated data, which identifies the registered professional engineer who

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approved the data, shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Division upon request.

6. Option (4) - Design by a registered professional engineer.

- (1) Support systems, shield systems, and other protective systems not utilizing Option 1, Option 2, or Option 3, above, shall be approved by a registered professional engineer.
 - (2) Designs shall be in written form and shall include the following:
 - (3) A plan indicating the sizes, types, and configurations of the materials to be used in the protective system; and
 - (4) The identity of the registered professional engineer approving the design.
- b) At least one copy of the design shall be maintained at the jobsite during construction of the protective system. After that time, the design may be stored off the jobsite, but a copy of the design shall be made available to the Division upon request.

7. Materials and equipment.

- a) Materials and equipment used for protective systems shall be free from damage or defects that might impair their proper function.
- b) Manufactured materials and equipment used for protective systems shall be used and maintained in a manner that is consistent with the recommendations of the manufacturer, and in a

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manner that will prevent employee exposure to hazards.

- c) When material or equipment that is used for protective systems is damaged, a competent person shall examine the material or equipment and evaluate its suitability for continued use. If the competent person cannot assure the material or equipment is able to support the intended loads or is otherwise suitable for safe use, then such material or equipment shall be removed from service, and shall be evaluated and approved by a registered professional engineer before being returned to service.

8. Installation and removal of supports.

- a) General.
- b) Members of support systems shall be securely connected together to prevent sliding, falling, kick outs, or other predictable failure.
- c) Support systems shall be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the support system.
- d) Individual members of support systems shall not be subjected to loads exceeding those, which those members were designed to withstand.
- e) Before temporary removal of individual members begins, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.
- f) Removal shall begin at, and progress from, the bottom of the excavation. Members shall be

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released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.

- g) Backfilling shall progress together with the removal of support systems from excavations.
- h) Additional requirements for support systems for trench excavations.
- i) Excavation of material to a level no greater than 2 feet below the bottom of the members of a support system shall be permitted, but only if the system is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the support system.
- j) Installation of a support system shall be closely coordinated with the excavation of trenches.
- k) Sloping and benching systems. Employees shall not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when employees at the lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

9. Shield systems.

- a) General.
- b) Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.
- c) Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield

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in the event of the application of sudden lateral loads.

- d) Employees shall be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.
- e) Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.
- f) Additional requirement for shield systems used in trench excavations. Excavations of earth material to a level not greater than 2 feet below the bottom of a shield shall be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.

C. Appendix A

D. Soil Classification

(a) Scope and application.

(1) Scope. This appendix describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. The appendix contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.

(2) Application. This appendix applies when a sloping or benching system is designed in accordance with the requirements set forth in Section 085:(2) as a method of protection for employees from cave-ins. This appendix also applies when timber shoring for excavations is designed as a method of protection from cave-ins in accordance with Appendix C to this article, and when aluminum hydraulic shoring is designed in accordance with Appendix D. This appendix also applies if other protective systems are designed and selected for use from data prepared in accordance with the requirements set forth in Section 090: and the use of the data is predicated on the use of the soil classification system set forth in this appendix.

(b) Definitions.

Cemented soil. A soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

Cohesive soil. Clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical side slopes, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.

Dry soil. Soil that does not exhibit visible signs of moisture content.

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Fissured. A soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

Granular soil. Gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

Layered system. Two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

Moist soil. A condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

Plastic. A property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.

Saturated soil. A soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or shear vane.

Soil classification system. A method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the environmental conditions of exposure.

Stable rock. Natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Submerged soil. Soil which is underwater or is free seeping.

Type A soil. Cohesive soils with an unconfined, compressive strength of 1.5 ton per square foot (tsf) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

(1) The soil is fissured; or

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- (2) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or
- (3) The soil has been previously disturbed; or
- (4) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
- (5) The material is subject to other factors that would require it to be classified as a less stable material.

Type B soil:

- (1) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf; or
- (2) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.
- (3) Previously disturbed soils except those which would otherwise be classed as Type C soil.
- (4) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or
- (5) Dry rock that is not stable; or
- (6) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C soil:

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- (1) Cohesive soil with an unconfined compressive strength of 0.5 tsf or less; or
- (2) Granular soils including gravel, sand, and loamy sand; or
- (3) Submerged soil or soil from which water is freely seeping; or
- (4) Submerged rock that is not stable, or
- (5) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

Unconfined compressive strength. The load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

Wet soil. Soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

(c) Requirements.

(1) Classification of soil and rock deposits. Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in paragraph (b) of this appendix.

(2) Basis of classification. The classification of the deposits shall be made based on the results of at least one visual and at least one manual analysis. Such analyses shall be conducted by a competent person using tests described in paragraph (d) below, or in other approved methods of soil classification and testing such as those adopted by the

American Society for Testing Materials, or the U.S. Department of Agriculture textural classification system.

(3) Visual and manual analyses. The visual and manual analyses, such as those noted as being acceptable in paragraph (d) of this appendix, shall be designed and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors, and conditions affecting the classification of the deposits.

(4) Layered systems. In a layered system, the system shall be classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.

(5) Reclassification. If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a competent person. The deposit shall be reclassified as necessary to reflect the changed circumstances.

(d) Acceptable visual and manual tests.

(1) Visual tests. Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

(A) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.

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(B) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breads up easily and does not stay in clumps is granular.

(C) Observe the side of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spill off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.

(D) Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.

(E) Observe the opened side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.

(F) Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.

(G) Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

(2) Manual tests. Manual analysis of soil samples in conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.

(A) Plasticity. Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8-inch in diameter. Cohesive material can be successfully rolled into

threads without crumbling. For example, if at least a two inch length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.

(B) Dry strength. If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breads into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered un-fissured.

(C) Thumb penetration. The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences (rain, flooding), the classification of the soil must be changed accordingly.

(D) Other strength tests. Estimates of unconfined compressive strength of soils can also be obtained by use of a pocket penetrometer or by using a hand-operated shearvane.

(E) Drying test. The basic purpose of the drying test is to differentiate between cohesive material with fissures, un-fissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick and six inches in diameter until it is thoroughly dry:

1. If the sample develops cracks as it dries, significant fissures are indicated.
2. Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as an un-fissured cohesive material and the unconfined compressive strength should be determined.
3. If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

Appendix B

Sloping and Benching

(a) Scope and application. This appendix contains specifications for sloping and benching when used as methods of protecting employees working in excavations from cave-ins. The requirements of this appendix apply when the design of sloping and benching protective systems is to be performed in accordance with the requirements set forth in Section 085:

(b) Definitions.

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Actual slope means the slope to which an excavation face is excavated.

Distress means that the soil is in a condition where a cave-in is imminent or is likely to occur. Distress is evidenced by such phenomena as the development of fissures in the face of or adjacent to an open excavation; the subsidence of the edge of an excavation; the slumping of material from the face or the bulging or heaving of material from the bottom of an excavation; the spalling of material from the face of an excavation; and ravelling, i.e., small amounts of material such as pebbles or little clumps of material suddenly separating from the face of an excavation and trickling or rolling down into the excavation.

Maximum allowable slope means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V),

Short term exposure means a period of time less than or equal to 24 hours that an excavation is open.

(c) Requirements.

(1) Soil classification. Soil and rock deposits shall be classified in accordance with Appendix A.

(2) Maximum allowable slope. The maximum allowable slope for a soil or rock deposit shall be determined from Table B-1 of this appendix.

(3) Actual slope.

(A) The actual slope shall not be steeper than the maximum allowable slope.

(B) The actual slope shall be less steep than the maximum allowable slope, when there are signs of distress. If that situation occurs, the slope shall be cut back to an actual

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slope which is at least $\frac{1}{2}$ horizontal to one vertical (1/2H:1V) less steep than the maximum allowable slope.

(C) When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope, and shall assure that such reduction is achieved. Surcharge loads from adjacent structures shall be evaluated in accordance with Section 060.

(4) Configurations. Configurations of sloping and benching systems shall be in accordance with Figure B-1.

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TABLE B-1

MAXIMUM ALLOWABLE SLOPES

SOIL OR ROCK TYPE	[1] MAXIMUM ALLOWABLE SLOPES (H:V) FOR EXCAVATIONS LESS THAN 20 FEET DEEP [3]
STABLE ROCK TYPE A [2] TYPE B TYPE C	VERTICAL (90) 3/4 : 1 (53) 1 : 1 (45) 1 1/2 : 1 (34)

NOTES:

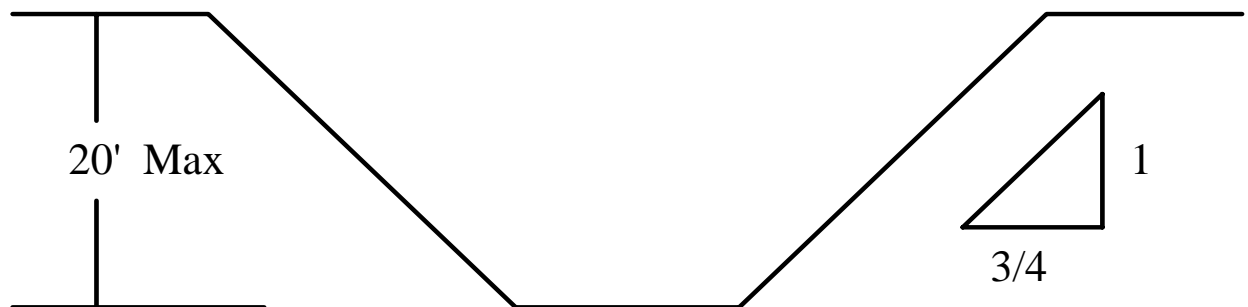
1. Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.
2. A short-term maximum allowable slope of 1/2H:1V (63 degrees) is allowed in excavations in Type A soil that are 12 feet or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet in depth shall be 3/4H:1V (53 degrees).
3. Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

**FIGURE B-1
SLOPE CONFIGURATIONS**

(All slopes stated below are in the horizontal to vertical ratio)

B - 1.1 Excavations made in Type A soil.

1. All simple slope excavations 20 feet or less in depth shall give maximum allowable slope of 3/4:1

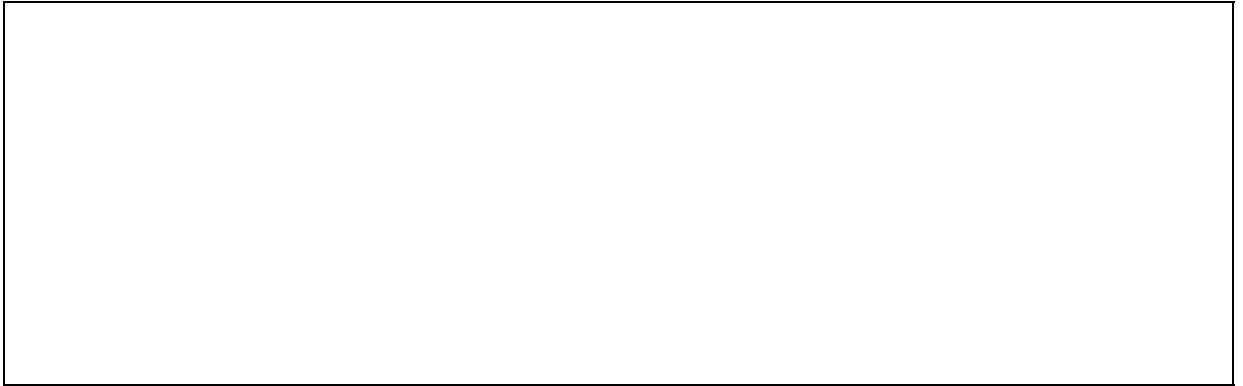


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Simple Slope - General

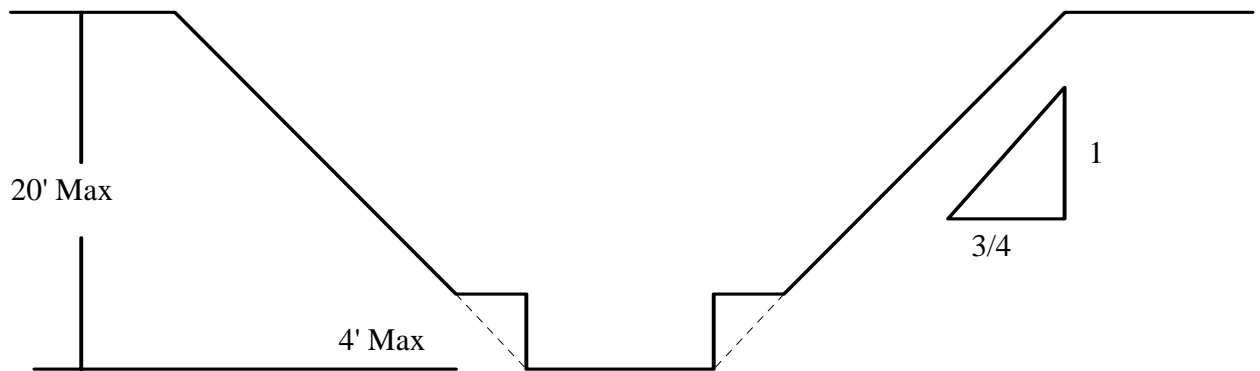
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Exception: Simple slope excavations which are open 24 hours or less (short term) and which are 12 feet or less in depth shall have a maximum allowable slope of 1/2:1



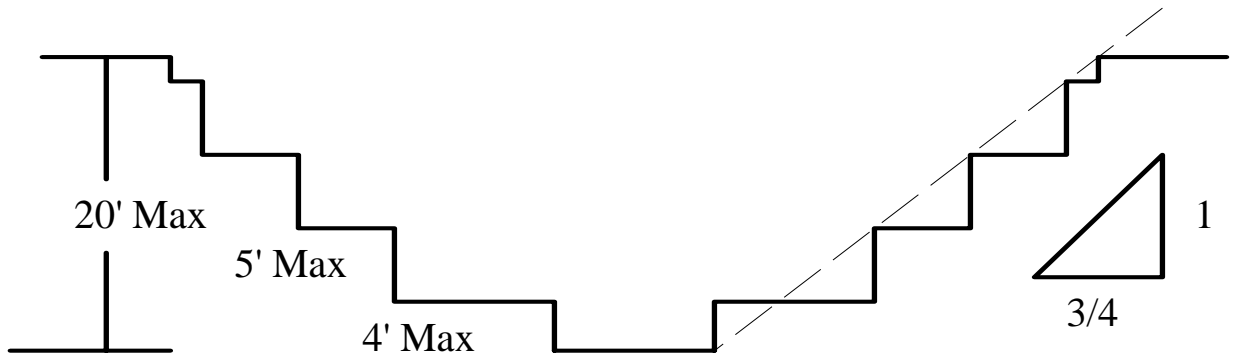
Simple Slope - Short Term

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 3/4 to 1 and maximum bench dimensions as follows.



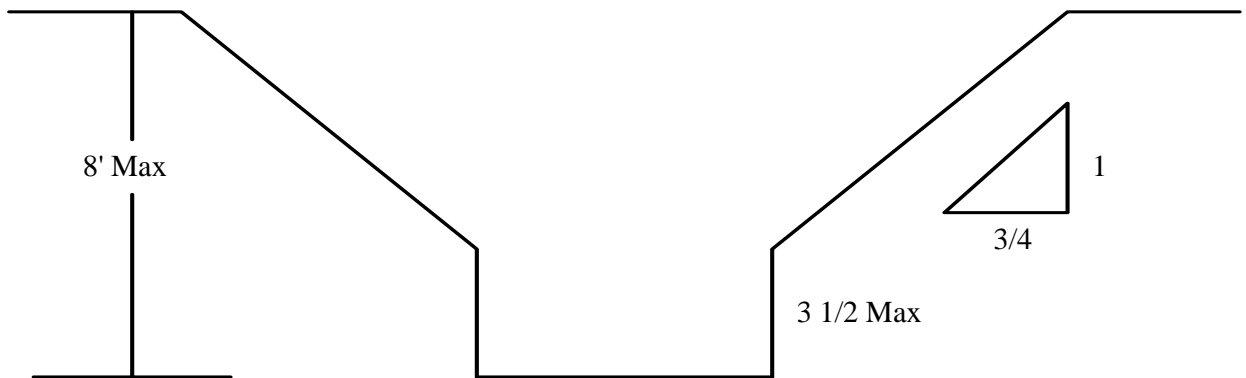
Simple Bench

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Multiple Bench

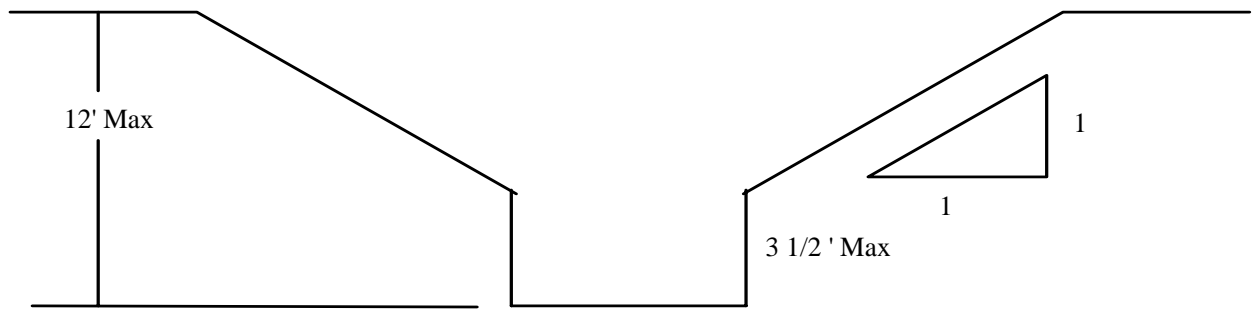
3. All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side 3 1/2 feet.



Unsupported Vertically Sided Lower Portion - Maximum 8 Feet in Depth

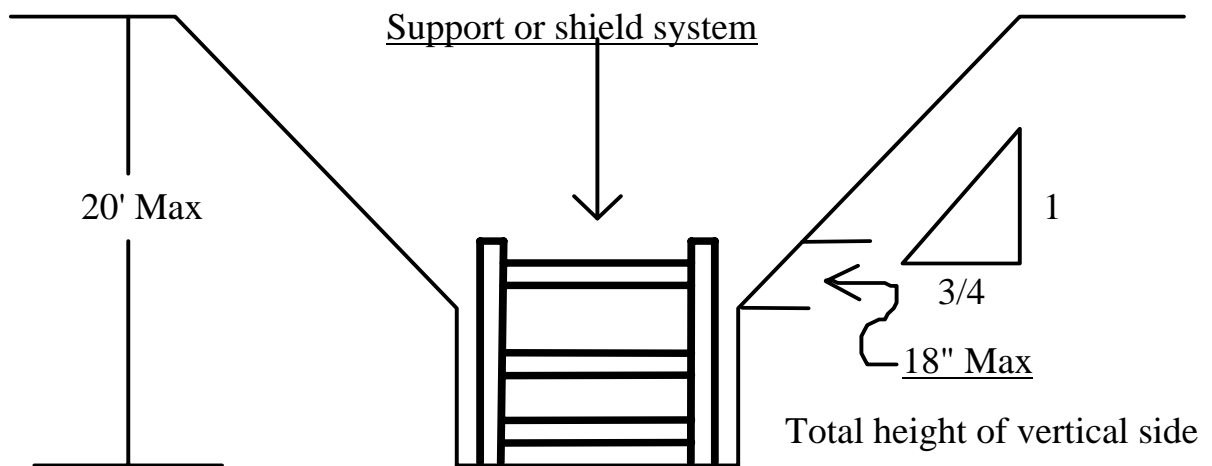
All excavations more than 8 feet but not more than 12 feet in depth with unsupported vertically sided lower portions shall have a maximum allowable slope of 1:1 and a maximum vertical side of 3 1/2 feet.

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Unsupported Vertically Sided Lower Portion - Maximum 12 Feet
in Depth

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of 3/4:1. The support or shield system must extend at least 18 inches above the top of the vertical side.



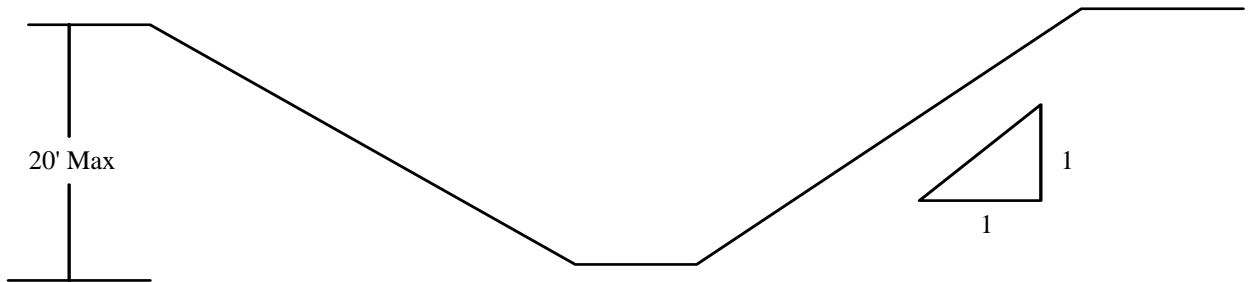
Supported or Shielded Vertically Sided Lower Portion

4. All other simple slope, compound slope and vertically sided lower portion excavations shall be in accordance with the other options permitted under 085:

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B - 1.2 Excavation Made in Type B Soil

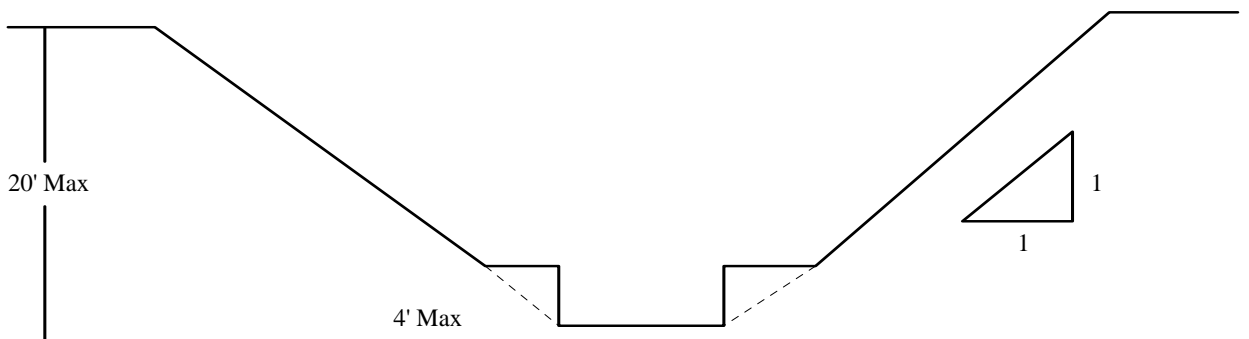
1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1/



Simple Slope

2. All benched excavation 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maximum bench dimensions as follows.

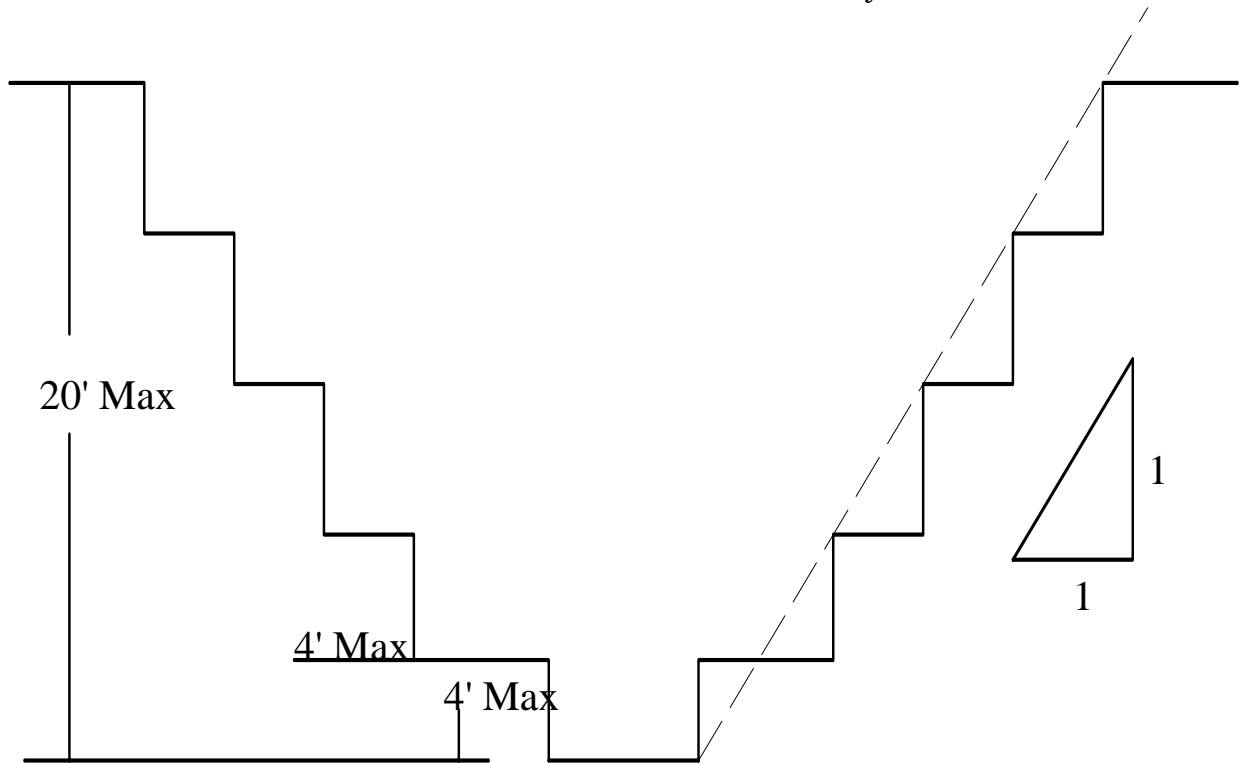
This bench allowed in cohesive soil only.



Single Bench

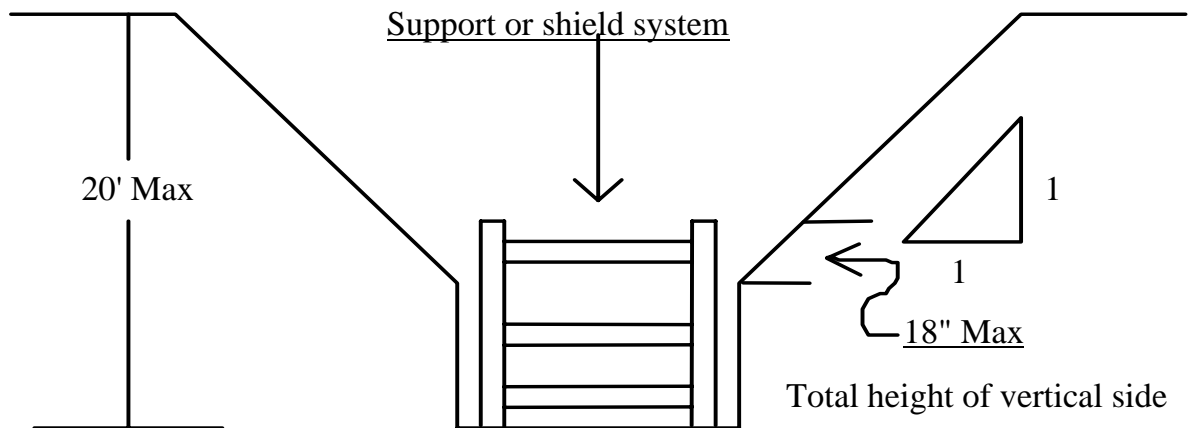
**ENVIRONMENTAL PRODUCTS & APPLICATIONS,
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This bench allowed in cohesive soil only



Multiple Bench

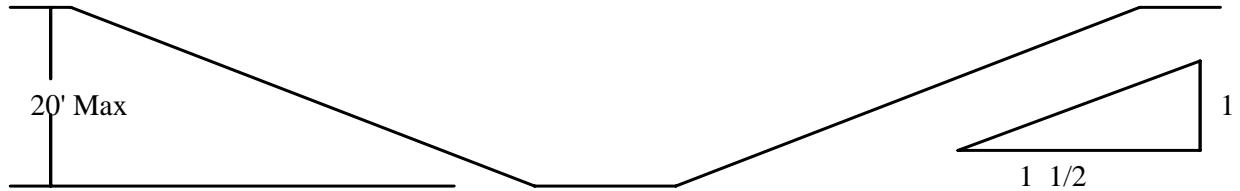
3. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height of at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1:1



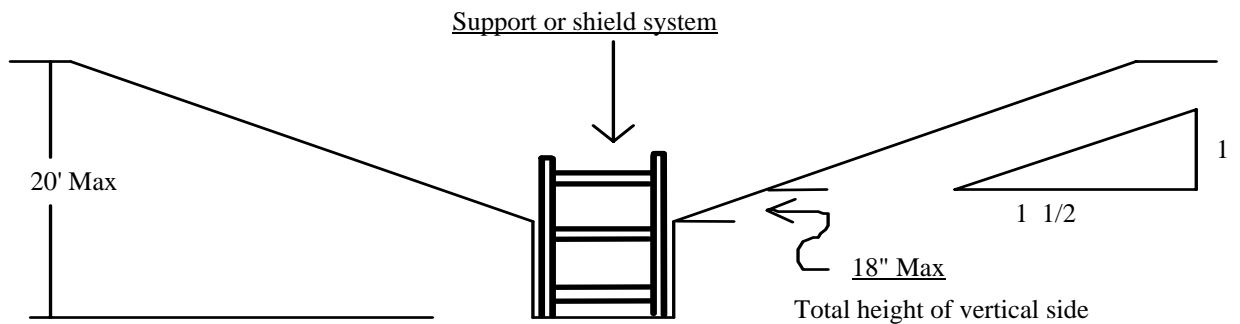
Vertically Sided Lower Portion

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4. All other sloped excavation shall be in accordance with the other options permitted in 1541.1(b) 1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1 1/2:1



2. All excavations 20 feet or less in depth which have vertically sided lower portions that are shielded or supported to at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1 1/2:1.

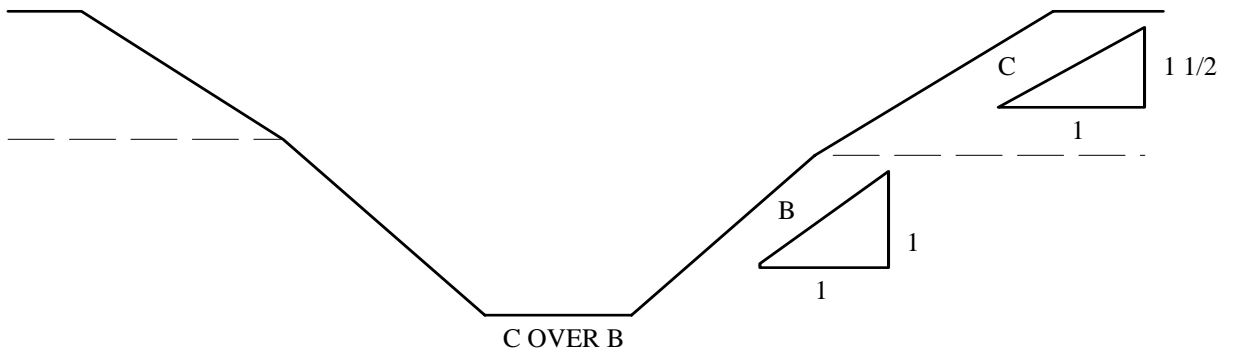
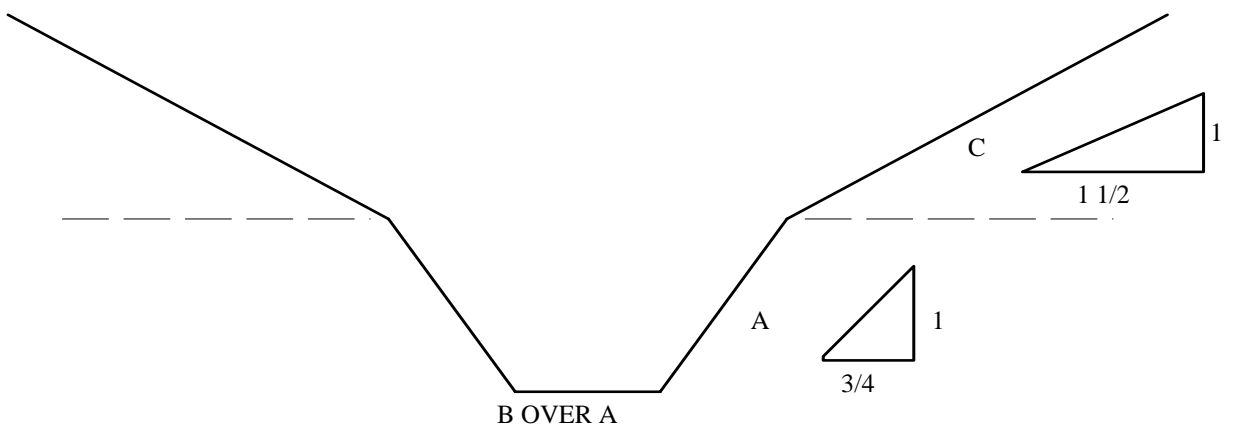
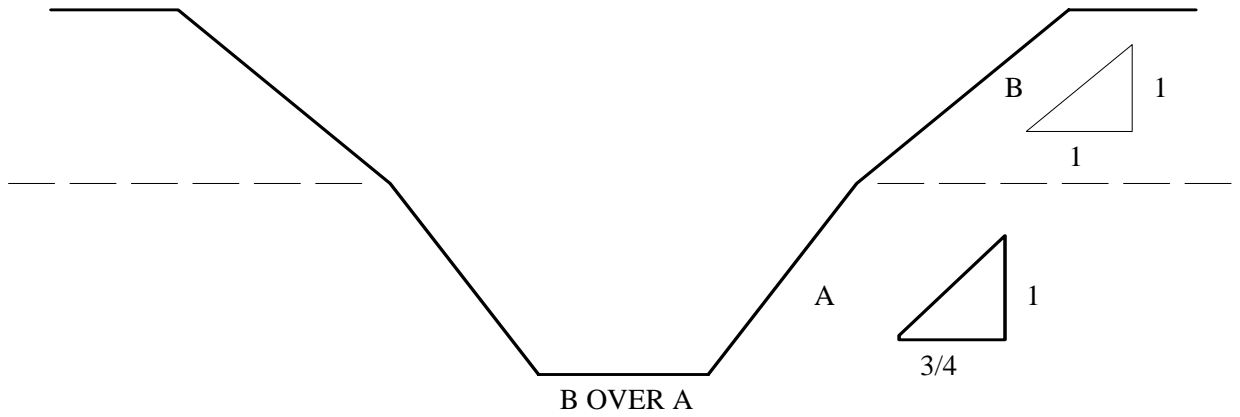


Vertically Sided Lower Portion

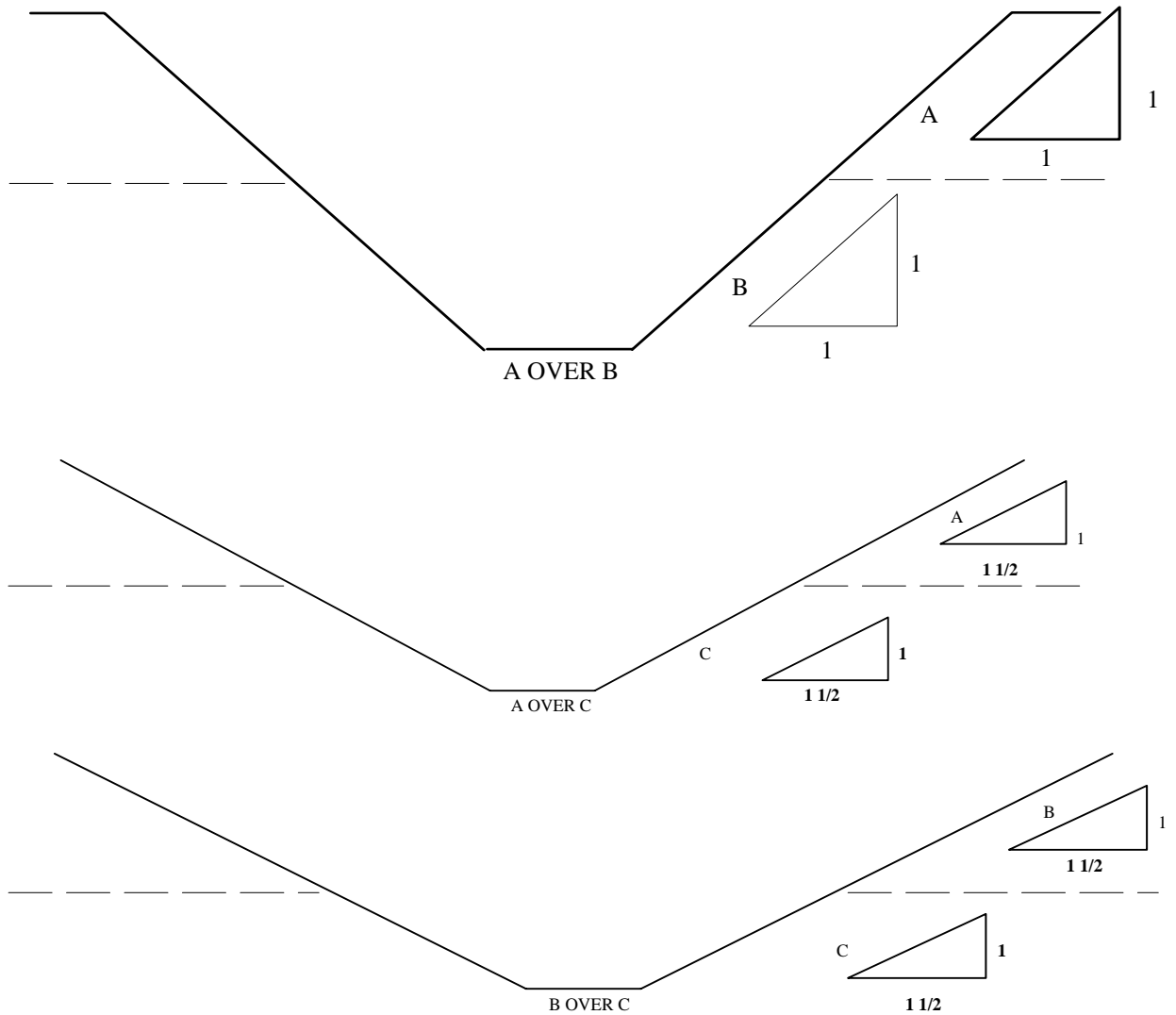
3. All other sloped excavations shall be in accordance with the other options permitted in 1541.1(b).

1. All excavations 20 feet or less in depth made in layered soils shall have a maximum allowable slope for each layer as set forth below.

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2. All other sloped excavations shall be in accordance with the other options permitted in 085:.

Note: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

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Appendix C

Timber Shoring for Trenches

(a) Scope. This appendix contains information that can be used when timber shoring is provided as a method of protection from cave-ins in trenches that do not exceed 20 feet in depth. This appendix must be used when design of timber shoring protective systems is to be performed in accordance with Section 085:(1). Other timber shoring configurations; other systems of support such as hydraulic and pneumatic systems; and other protective systems such as sloping, benching, shielding, and freezing systems must be designed in accordance with the requirements set forth in Section 085: and 090:.

(b) Soil Classification. In order to use the data presented in this appendix, the soil type or types in which the excavation is made must first be determined using the soil classification method set forth in Article 6.

(c) Presentation of Information.

Information is presented in several forms as follows:

(1) Information is presented in tabular form in Tables C-1.1, C-1.2 and C-1.3, and Tables C-2.1, C-2.2 and C-2.3 following Section (g) of Appendix C. Each table presents the minimum sizes of timber members to use in a shoring system, and each table contains data only for the particular soil type in which the excavation or portion of the excavation is made. The data are arranged to allow the user the flexibility to select from among several acceptable configurations of members based on varying the horizontal spacing of the crossbraces. Stable rock is

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exempt from shoring requirements and therefore, no data are presented for this condition.

(2) Information concerning the basis of the tabular data and the limitations of the data is presented in Section (d) of this appendix, and on the tables themselves.

(3) Information explaining the use of the tabular data is presented in Section (e) of this appendix.

(4) Information illustrating the use of the tabular data is presented in Section (f) of this appendix.

(5) Miscellaneous notations regarding Tables C-1.1 through C-1.3 and Tables C-2.1 through C-2.3 are presented in Section (g) of this appendix.

(d) Basis and limitations of the data.

(1) Dimensions of timber members.

(A) The sizes of the timber members listed in Tables C-1.1 through C-1.3 are taken from the National Bureau of Standards (NBS) report, "Recommended Technical Provisions for Construction Practice in Shoring and Sloping of Trenches and Excavations." In addition, where NBS did not recommend specific sizes of members, member sizes are based on an analysis of the sizes required for use by existing codes and on empirical practice.

(B) The required dimensions of the members listed in Tables C-1.1 through C-1.3 refer to actual dimensions and not nominal dimensions of the timber. Employers wanting to use nominal size shoring are

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directed to Tables C-2.1 through C-2.3, or have this choice under Section 090:(3).

(2) Limitation of application.

(A) It is not intended that the timber shoring specification apply to every situation that may be experienced in the field. These data were developed to apply to the situations that are most commonly experienced in current trenching practice. Shoring systems for use in situations that are not covered by the data in this appendix must be designed as specified in Section 090.

(B) When any of the following conditions are present, the members specified in the tables are not considered adequate. Either an alternate timber shoring system must be designed or another type of protective system designed in accordance with Section 080:.

1. When loads imposed by structures or by stored material adjacent to the trench weigh in excess of the load imposed by a two-foot soil surcharge. The term "adjacent" as used here means the area within a horizontal distance from the edge of the trench equal to the depth of the trench.

2. When vertical loads imposed on cross braces exceed a 240-pound gravity load distributed on a one-foot section of the center of the cross brace.

3. When surcharge loads are present from equipment weighing in excess of 20,000 pounds.

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4. When only the lower portion of a trench is shored and the remaining portion of the trench is sloped or benched unless: The sloped portion is sloped at an angle less steep than three horizontal to one vertical; or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

(e) Use of Tables. The members of the shoring system that are to be selected using this information are the cross braces, the uprights, and the wales, where wales are required. Minimum sizes of members are specified for use in different types of soil. There are six tables of information, two for each soil type. The soil type must first be determined in accordance with the soil classification system described in Appendix A. Using the appropriate table, the selection of the size and spacing of the members is then made. The selection is based on the depth and width of the trench where the members are to be installed and, in most instances, the selection is also based on the horizontal spacing of the crossbraces. Instances where a choice of horizontal spacing of crossbracing is available, the horizontal spacing of the crossbraces must be chosen by the user before the size of any member can be determined. When the soil type, the width and depth of the trench, and the horizontal spacing of the crossbraces, the size and vertical spacing of the crossbraces are known, the size and vertical spacing of the crossbraces, the size and vertical spacing of the wales, and the size and horizontal spacing of the uprights can be read from the appropriate table.

(f) Examples to Illustrate the Use of Tables C-1.1 through C-1.3.

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(1) Example 1.

A trench dug in Type A soil is 13 feet deep and five feet wide. From Table C-1.1, four acceptable arrangements of timber can be used.

Arrangement #1

Space 4X4 crossbraces at six feet horizontally and four feet vertically. Wales are not required.

Space 3X8 uprights at six feet horizontally. This arrangement is commonly called "skip shoring."

Arrangement #2

Space 4X6 crossbraces at eight feet horizontally and four feet vertically.

Space 8X8 wales at four feet vertically.

Space 2X6 uprights at four feet horizontally.

Arrangement #3

Space 6X6 crossbraces at 10 feet horizontally and four feet vertically.

Space 8X10 wales at four feet vertically.

Space 2X6 uprights at five feet horizontally.

Arrangement #4

Space 6X6 crossbraces at 12 feet horizontally and four feet vertically.

Space 10X10 wales at four feet vertically.

Space 3X8 uprights at six feet horizontally.

(2) Example 2.

A trench dug in Type B soil is 13 feet deep and five feet wide. From Table C-1.2 three acceptable arrangements of members are listed.

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Arrangement #1

Space 6X6 cross braces at six feet horizontally and five feet vertically.

Space 8X8 Wales at five feet vertically.

Space 2X6 uprights at two feet horizontally.

Arrangement #2

Space 6X8 cross braces at eight feet horizontally and five feet vertically.

Space 10X10 Wales at five feet vertically.

Space 2X6 uprights at two feet horizontally.

Arrangement #3

Space 8X8 cross braces at 10 feet horizontally and five feet vertically.

Space 10X12 Wales at five feet vertically.

Space 2X6 uprights at two feet vertically.

(3) Example 3.

A trench dug in Type C soil is 13 feet deep and five feet wide.

From Table C-1.3 two acceptable arrangements of members can be used.

Arrangement #1

Space 8X8 cross braces at six feet horizontally and five feet vertically.

Space 10X12 Wales at five feet vertically.

Position 2X6 uprights as closely together as possible.

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If water must be retained use special tongue and groove uprights to form tight sheeting.

Arrangement #2

Space 8X10 cross braces at eight feet horizontally and five feet vertically.

Space 12X12 Wales at five feet vertically.

Position 2X6 uprights in a close sheeting configuration unless water pressure must be resisted. Tight sheeting must be used where water must be retained.

(4) Example 4.

A trench dug in Type C soil is 20 feet deep and 11 feet wide. The size and spacing of members for the section of trench that is over 15 feet in depth is determined using Table C-1.3. Only one arrangement of members is provided.

Space 8X10 crossbraces at six feet horizontally and five feet vertically.

Space 12X12 wales at five feet vertically.

Use 3X6 tightsheeting.

Use of Tables C-2.1 through C-2.3 would follow the same procedures.

(g) Notes for all Tables.

1. Members sizes at spacings other than indicated are to be determined as specified in Section 080:©, "Design of Protective Systems."
2. When conditions are saturated or submerged use Tight Sheeting. Tight Sheeting refers to the use of

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specially-edged timber planks (e.g., tongue and groove) at least three inches thick, steel sheet piling, or similar construction that when driven or placed in position provide a tight wall to resist the lateral pressure of water and to prevent the loss of backfill material. Close Sheeting refers to the placement of planks side-by-side allowing as little space as possible between them.

3. All spacing indicated is measured center to center.

4.. Wales to be installed with greater dimension horizontal.

5. If the vertical distance from the center of the lowest crossbrace to the bottom of the trench exceeds two and one-half feet, uprights shall be firmly embedded or a mudsill shall be used. Where uprights are embedded, the vertical distance from the center of the lowest crossbrace to the bottom of the trench shall not exceed 36 inches. When mudsills are used, the vertical distance shall not exceed 42 inches. Mudsills are wales that are installed at the toe of the trench side.

6. Trench jacks may be used in lieu of or in combination with timber crossbraces.

1. Placement of crossbraces. When the vertical spacing of crossbraces is four feet, place the top crossbrace no more than two feet below the top of the trench. When the vertical spacing of crossbraces is five feet, place the top crossbrace no more than 2.5 feet below the top of the trench. 244-6611.

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TABLE C-1.1

TIMBER TRENCH SHORING - MANIMUM TIMBER REQUIREMENTS*

SOIL TYPE A $P_a = 25 \times H + 72$ psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**													
	CROSS BRACES									UPRIGHTS				
	HORI Z. SPAC ING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACI NG (FEET)	SIZE (IN)	VERT. SPACI NG (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15								
										CLOS E	4	5	6	8
5 TO 10	UP TO 6	4X4	4X4	4X4	4X4	4X6	4	Not Req'd	-----				2X6	
	UP TO 8	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	-----					2X8
	UP TO	4X6	4X6	4X6	6X6	6X6	4	8X8	4			2X6		

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	10												
	UP TO 12	4X6	4X6	6X6	6X6	6X6	4	8X8	4				2X6
10 TO 15	UP TO 6	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	-----				3X8
	UP TO 8	4X6	4X6	6X6	6X6	6X6	4	8X8	4		2X6		
	UP TO 10	6X6	6X6	6X6	6X8	6X8	4	8X10	4			2X6	
	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	10X1 0	4				3X8
15 TO 20	UP TO 6	6X6	6X6	6X6	6X8	6X8	4	6X8	4	3X6			
	UP TO 8	6X6	6X6	6X6	6X8	6X8	4	8X8	4	3X6			
	UP TO 10	8X8	8X8	8X6	8X8	8X10	4	8X10	4	3X6			

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	UP TO 12	8X8	8X8	8X6	8X8	8X10	4	10X1 0	4	3X6				
OVER 20	See Note 1													

* Douglas fir of equivalent with a bending strength not less than 850 psi.

** Manufactured member of equivalent strength may be substituted for wood.

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TABLE C-2.1 TIMBER TRENCH SHORING - MANIMUM TIMBER REQUIREMENTS*
SOIL TYPE B $P_a = 45 \times H + 72$ psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**													
	CROSS BRACES									UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15								
										CLOSE	2	3		
5 TO 10	UP TO 6	4X6	4X6	6X6	6X6	6X6	5	6X8	5			2X6		
	UP TO 8	6X6	6X6	6X6	6X8	6X8	5	8X8	5			2X6		
	UP TO 10	6X6	6X6	6X6	6X8	6X8	5	10X10	5			2X6		
	See Note 1													
10 TO 15	UP TO 6	6X6	6X6	6X6	6X8	6X8	5	8X8	5		2X6			
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X10	5		2X6			
	UP TO 10	8X8	8X8	8X8	8X8	8X10	5	10X12	5		2X6			
	See Note 1													
15 TO 20	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	8X10	5	3X6				
	UP TO 8	8X8	8X8	6X8	8X8	8X10	5	10X12	5	3X6				
	UP TO 10	8X10	8X10	8X10	8X10	10X10	5	12X12	5	3X6				
	See Note 1													
OVER 20	See Note 1													

* Douglas fir or equivalent with a bending strength not less than 1500 psi.

** Manufactured member of equivalent strength may be substituted for wood.

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TABLE C-1.3 TIMBER TRENCH SHORING - MANIMUM TIMBER REQUIREMENTS*SOIL TYPE A $P_a = 80 X + 72$ psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**													
	CROSS BRACES									UPRIGHTS				
	HORIZ. SPACIN G (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET) (See Note 2)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15								
5 TO 10	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	8X10	5	CLOSE 2X6				
	UP TO 8	8X8	8X8	8X8	8X8	8X10	5	10X12	5	2X6				
	UP TO 10	8X10	8X10	8X10	8X10	8X10	5	12X12	5	2X6				
	See Note 1													
10 TO 15	UP TO 6	8X8	8X8	8X8	8X8	8X10	5	10X12	5	2X6				
	UP TO 8	8X10	8X10	8X10	8X10	8X10	5	12X12	5	2X6				
	See Note 1													
	See Note 1													
15 TO 20	UP TO 6	8X10	8X10	8X10	8X10	8X10	5	12X12	5	2X6				
	See Note 1													
	See Note 1													
	See Note 1													
OVER 20	See Note 1													

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* Mixed Oak or equivalent with a bending strength not less than 850 psi.

** Manufactured member of equivalent strength may be substituted for wood.

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TABLE C-2.1

TIMBER TRENCH SHORING - MAXIMUM TIMBER REQUIREMENTS*
SOIL TYPE A $P_a = 25 \times +72$ psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**													
	HORIZ. SPACING (FEET)	CROSS BRACES					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	UPRIGHTS				
		WIDTH OF TRENCH (FEET)								MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE	4	5	6	8
5 TO 10	UP TO 6	4X4	4X4	4X4	4X4	4X6	4	Not Req'd	Not Req'd				4X6	
	UP TO 8	4X4	4X4	4X4	4X6	4X6	4	Not Req'd	Not Req'd					4X8
	UP TO 10	4X6	4X6	4X6	6X6	6X6	4	8X8	4			4X6		
	UP TO 12	4X6	4X6	4X6	6X6	6X6	4	8X8	4				4X6	
10 TO 15	UP TO 6	4X4	4X4	4X4	6X6	6X6	4	Not Req'd	Not Req'd				4X10	
	UP TO 8	4X6	4X6	4X6	6X6	6X6	4	6X8	4		4X6			
	UP TO 10	6X6	6X6	6X6	6X6	6X6	4	8X8	4			4X8		
	UP TO 12	6X6	6X6	6X6	6X6	6X6	4	8X10	4		4X6		4X10	
15 TO 20	UP TO 6	6X6	6X6	6X6	6X6	6X6	4	6X8	4	3X6				
	UP TO 8	6X6	6X6	6X6	6X6	6X6	4	8X8	4	3X6	4X12			
	UP TO 10	6X6	6X6	6X6	6X6	6X8	4	8X10	4	3X6				
	UP TO 12	6X6	6X6	6X6	6X6	6X8	4	8X12	4	3X6	4X12			
OVER 20	See Note 1													

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* Douglas fir of equivalent with a bending strength not less than 1500 psi.
** Manufactured member of equivalent strength may be substituted for wood.

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TABLE C-2.2
TIMBER TRENCH SHORING - MANIMUM TIMBER REQUIREMENTS*
SOIL TYPE B $P_a = 45$ H 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**													
	CROSS BRACES									UPRIGHTS				
	HORIZ. SPACIN G (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE	2	3	4	6
5 TO 10	UP TO 6	4X6	4X6	4X6	6X6	6X6	5	6X8	5			3X12 4X8		4X12
	UP TO 8	4X6	4X6	6X6	6X6	6X6	5	8X8	5		3X8		4X8	
	UP TO 10	4X6	4X6	6X6	6X6	6X8	5	8X10	5			4X8		
	UP TO 12													
10 TO 15	UP TO 6	6X6	6X6	6X6	6X8	6X8	5	8X8	5	3X6	4X10			
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X10	5	3X6	4X10			
	UP TO 10	6X8	6X8	8X8	8X8	8X8	5	10X12	5	3X6	4X10			
	UP TO 12													
15 TO 20	UP TO 6	6X8	6X8	6X8	6X8	8X8	5	8X10	5	4X6				
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X12	5	4X6				
	UP TO 10	8X8	8X8	8X8	8X8	8X8	5	12X12	5	4X6				
	UP TO													

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	12													
OVER 20	See Note 1													

* Douglas fir of equivalent with a bending strength not less than 1500 psi.
** Manufactured member of equivalent strength may be substituted for wood.

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TABLE C-2.3
TIMBER TRENCH SHORING - MAXIMUM TIMBER REQUIREMENTS*
SOIL TYPE C $P_a = 25 \text{ X} + 72 \text{ psf}$ (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**													
	CROSS BRACES									UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15								
5 TO 10	UP TO 6	6X6	6X6	6X6	6X6	8X8	5	8X8	5	3X6				
	UP TO 8	6X6	6X6	6X6	8X8	8X8	5	10X10	5	3X6				
	UP TO 10	6X6	6X6	8X8	8X8	8X8	5	10X12	5	3X6				
	See Note 1													
10 TO 15	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	10X10	5					
	UP TO 8	8X8	8X8	8X8	8X8	8X8	5	12X12	5					
	See Note 1													
	See Note 1													
15 TO 20	UP TO 6	8X8	8X8	8X8	8X10	8X10	5	10X12	5					
	See Note 1													
	See Note 1													
	See Note 1													

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OVER 20	See Note 1
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* Douglas fir of equivalent with a bending strength not less than 1500 psi.

** Manufactured member of equivalent strength may be substituted for wood

Appendix D

Aluminum Hydraulic Shoring for Trenches

(a) Scope. This appendix contains information that can be used when aluminum hydraulic shoring is provided as a method of protection against cave-ins in trenches that do not exceed 20 feet in depth. This appendix must be used when design of the aluminum hydraulic protective system cannot be performed in accordance with Section 080:©(2).

(b) Soil Classification. In order to use data presented in this appendix, the soil type or types in which the excavation is made must first be determined using the soil classification method set forth in Appendix A of this Article.

(c) Presentation of Information. Information is presented in several forms as follows:

(1) Information is presented in tabular form in Tables D-1.1, D-1.2, D-1.3 and D-1.4. Each table presents the maximum vertical and horizontal spacings that may be used with various aluminum member sizes and various hydraulic cylinder sizes. Each table contains data only for the particular soil type in which the excavation or portion of the excavation is made. Tables D-1.1 and D-1.2 are for vertical shores in Types A and B soil. Tables D-1.3 and D-1.4 are for horizontal waler systems in Types B and C soil.

(2) Information concerning the basis of the tabular data and the limitations of the data is presented in Section (d) of this appendix.

(3) Information explaining the use of the tabular data is presented in Section (e) of this appendix.

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(4) Information illustrating the use of the tabular data is presented in Section (f) of this appendix.

(5) Miscellaneous notations (footnotes) regarding Table D-1.1 through D-1.4 are presented in Section (g) of this appendix.

(6) Figures, illustrating typical installations of hydraulic shoring, are included just prior to the Tables. The illustrations page is entitled "Aluminum Hydraulic Shoring: Typical Installations."

(d) Basis and limitations of the data.

(1) Vertical shore rails and horizontal wales are those that meet the Section Modulus requirements in the D-1 Tables. Aluminum material is 6061-T6 or material of equivalent strength and properties.

(2) Hydraulic cylinders specifications.

(A) 2-inch cylinders shall be a minimum 2-inch inside diameter with a minimum safe working capacity of no less than 18,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(B) 3-inch cylinders shall be minimum 3-inch inside diameter with a safe working capacity of not less than 30,000 pounds axial compressive load at extensions as recommended by product manufacturer.

(3) Limitation of application.

(A) It is not intended that the aluminum hydraulic specification apply to every situation that may be experienced in the field. These data were developed to apply to the situations that are most commonly experienced in current trenching practice. Shoring systems for use in

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situations that are not covered by the data in this appendix must be otherwise designed as specified in Section 090.

(B) When any of the following conditions are present, the members specified in the Tables are no considered adequate. In this case, an alternative aluminum hydraulic shoring system or other type of protective system must be designed in accordance with Section 090:.

1. When vertical loads imposed on cross braces exceed a 100 pound gravity load distributed on a one foot section of the center of the hydraulic cylinder.
2. When surcharge loads are present from equipment weighing in excess of 20,000 pounds.
3. When only the lower portion of a trench is shored and the remaining portion of the trench is sloped or benched unless: The sloped portion is sloped at an angle less steep than three horizontal to one vertical; or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

(e) Use of Tables D-1.1, D-1.2, D-1.3 and D-1.4. The members of the shoring system that are to be selected using this information are the hydraulic cylinders, and either the vertical shores or the horizontal wales. When a waler system is used the vertical timber sheeting to be used is also selected from these tables. The Tables D-1.1 and D-1.2 for vertical shores are used in Type A and B soils that do not require sheeting. Type B soils that may require sheeting, and Type C soils that always require sheeting, are found in the horizontal wale Tables D-1.3 and D-1.4. The soil type must first be determined in accordance with the soil classification system described in Appendix A. Using the appropriate table, the selection of the size and spacing of the members is made. The selection is based on the depth and width of the trench where the members are to be installed. In these tables the vertical spacing is held constant at four feet on center. The tables show the maximum horizontal spacing of cylinders allowed for each size of wale in the waler system tables, and in the vertical shore tables, the hydraulic cylinder horizontal spacing is the same as the vertical shore spacing.

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(f) Example to Illustrate the Use of the Tables:

(1) Example 1.

A trench dug in Type A soil is 6 feet deep and 3 feet wide. From Table D-1.1: Find vertical shores and 2 inch diameter cylinders spaced 8 feet on center (o.c.) horizontally and 4 feet on center (o.c.) vertically. (See Figures 1 & 3 for typical installations.)

(2) Example 2:

A trench is dug in Type B soil that does not require sheeting, 13 feet deep and 5 feet wide. From Table D-1.2: Find vertical shores and 2 inch diameter cylinders spaced 6.5 feet o.c. horizontally and 4 feet o.c. vertically. (See Figures 1 & 3 for typical installations.)

(3) Example 3:

A trench is dug in Type B soil that does not require sheeting, but does experience some minor raveling of the trench face. The trench is 16 feet deep and 9 feet wide. From Table D-1.2: Find vertical shores and 2 inch diameter cylinder (with special oversleeves as designated by footnote #2) spaced 5.5 feet o.c. horizontally and 4 feet o.c. vertically. Plywood (per footnote (g)(7) to the D-1 Table) should be used behind the shores. (See Figures 2 & 3 for typical installations.)

(4) Example 4:

A trench is dug in previously disturbed Type B soil, with characteristics of a Type C soil, and will require sheeting. The trench is 18 feet deep, and 12 feet wide. 8 foot horizontal spacing between cylinders is desired for working space. From Table D-1.3: Find horizontal wale with a section modulus of 14.0 spaced at 4 feet o.c. vertically and 3 inch diameter cylinder spaced at 9 feet maximum o.c. horizontally, 3 x 12 timber sheeting is required at close spacing vertically. (See Figure 4 for typical installation.)

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(5) Example 5:

A trench is dug in Type C soil, 9 feet deep and 4 feet wide. Horizontal cylinder spacing in excess of 6 feet is desired for working space. From Table D-1.4: Find horizontal wale with a section modulus of 7.0 and 2 inch diameter cylinders spaced at 6.5 feet o.c. horizontally. Or, find horizontal wale with a 14.0 section modulus and 3 inch diameter cylinder spaced at 10 feet o.c. horizontally. Both wales are spaced 4 feet o.c. vertically, 3x12 timber sheeting is required at close spacing vertically. (See Figure 4 for typical installation.)

(g) Footnotes, and general notes, for Tables D-1.1, D-1.2, D-1.3, and D-1.4.

(1) For applications other than those listed in the tables, refer to Section 090:©(2) for use of manufacturer's tabulated data. For trench depths in excess of 20 feet, refer to Section 090:(2) and 090:(3).

(2) 2-inch diameter cylinders, at this width, shall have structural steel tube (3.5 x 3.5 x 0.1875) oversleeves, or structural oversleeves of manufacturer's specification, extending the full, collapsed length.

(3) Hydraulic cylinders capacities.

(A) 2-inch cylinders shall be a minimum 2-inch inside diameter with a safe working capacity of not less than 18,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(B) 3-inch cylinders shall be a minimum 3-inch inside diameter with a safe work capacity of not less than 30,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(4) All spacing indicated is measured center to center.

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- (5) Vertical shoring rails shall have a minimum section modulus of 0.40 inch.
- (6) When vertical shores are used, there must be a minimum of three shores spaced equally, horizontally, in a group.
- (7) Plywood shall be 1.125 inches thick of wood or 0.75 inch thick, 14 ply, arctic white birch (Finland form). Please note that plywood is not intended as a structural member, but only for prevention of local raveling (sloughing of the trench face) between shores.
- (8) See Appendix C for timber specifications.
- (9) Wales are calculated for simple span conditions.
- (10) See Appendix D, Section (d), for basis and limitations of the data.

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TABLE D - 1.1
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE A

DEPTH OF TRENCH (FEET)	HYDRAULLIC CYLINDERS				
	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)	WIDTH OF TRENCH (FEET)		
			UP TO 8	OVER 8 UP TO 12	OVER 12 UP TO 15
OVER 5 UP TO 10	8	4	2 INCH DIAMETER	2 INCH DIAMETER NOTE (2)	3 INCH DIAMETER
OVER 10 UP TO 15	8				
OVER 15 UP TO 20	7				
OVER 20	NOTE (1)				

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)

Note (1): See Appendix D, Item (g) (1)

Note (2): See Appendix D, Item (g) (2)

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**TABLE D - 1.2
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE B**

DEPPTH OF TRENCH (FEET)	HYDRAULLIC CYLINDERS				
	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)	WIDTH OF TRENCH (FEET)		
			UP TO 8	OVER 8 UP TO 12	OVER 12 UP TO 15
OVER 5 UP TO 10	8	4	2 INCH DIAMETER	2 INCH DIAMETER NOTE (2)	3 INCH DIAMETER
OVER 10 UP TO 15	6.5				
OVER 15 UP TO 20	5.5				
OVER 20	NOTE (1)				

Footnotes to tables, and general notes on hydraulic shoring, are fornd in Appendix D, Item (g)

Note (1): See Appendix D, Item (g) (1)

Note (2): See Appendix D, Item (g) (2)

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TABLE D - 13
ALUMINUM HYDRAULIC SHORING
WALER SYSTEMS
FOR SOIL TYPE B

DEPTH OF TRENCH (FEET)	WALES		HYDRAULIC CYLINDERS						TIMBER UPRIGHTS**		
	VERTICAL SPACING (FEET)	SECTION MODULUS (IN)	WIDTH OF TRENCH (FEET)						MAX. HORIZ. SPACING (ON CENTER)		
			UP TO 8		OVER 8 UP TO 12		OVER 2 UP TO 15		SOLID SHEET	2 FT.	3 FT.
			HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER			
OVER 5 UP TO 10	4	3.5	8.0	2 IN	8.0	2 IN NOTE (2)	8.0	3 IN	_____	_____	3X12
		7.0	9.0	2 IN	9.0	2 IN NOTE (2)	9.0	3 IN			
		14.0	12.0	3 IN	12.0	3 IN	12.0	3 IN			
OVER 10 UP TO 15	4	3.5	6.0	2 IN	6.0	2 IN NOTE (2)	6.0	3 IN	_____	3X12	_____
		7.0	8.0	3 IN	8.0	3 IN	8.0	3 IN			
		14.0	10.0	3 IN	10.0	3 IN	10.0	3 IN			
OVER 15 UP TO 20	4	3.5	5.5	2 IN	5.5	2 IN NOTE (2)	5.5	3 IN	3X12	_____	_____
		7.0	6.0	3 IN	6.0	3 IN	6.0	3 IN			
		14.0	9.0	3 IN	9.0	3 IN	9.0	3 IN			
OVER 20	NOTE 1										

Footnotes to tables, general notes on hydraulic shoring, are found in Appendix D, Item (g)

Notes (1): See Appendix D, Item (g) (2)

Notes (2): See Appendix D, Item (g) (2)

* Consult product manufacturer and/or qualified engineer for Section Modulus of available wales.

** Douglas fir of equivalent with a bending strength not less than 1500 psi.

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TABLE D - 1.4

ALUMINUM HYDRAULIC SHORING WALER SYSTEMS FOR SOIL TYPE C

DEPTH OF TRENCH (FEET)	WALES		HYDRAULIC CYLINDERS						TIMBER UPRIGHTS**		
	VERTICAL SPACING (FEET)	SECTION MODULUS (IN)	WIDTH OF TRENCH (FEET)						MAX. HORIZ. SPACING (ON CENTER)		
			UP TO 8		OVER 8 UP TO 12		OVER 2 UP TO 15		SOLID SHEET	2 FT.	3 FT.
			HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER			
OVER 5 UP TO 10	4	3.5	6.0	2 IN	6.0	2 IN NOTE (2)	6.0	3 IN	3X12	_____	_____
		7.0	6.5	2 IN	6.5	2 IN NOTE (2)	6.5	3 IN			
		14.0	10.0	3 IN	10.0	3 IN	10.0	3 IN			
OVER 10 UP TO 15	4	3.5	4.0	2 IN	4.0	2 IN NOTE (2)	4.0	3 IN	3X12	_____	_____
		7.0	5.5	3 IN	5.5	3 IN	5.5	3 IN			
		14.0	8.0	3 IN	8.0	3 IN	8.0	3 IN			
OVER 15 UP TO 20	4	3.5	3.5	2 IN	3.5	2 IN NOTE (2)	3.5	3 IN	3X12	_____	_____
		7.0	5.0	3 IN	5.0	3 IN	5.0	3 IN			
		14.0	6.0	3 IN	6.0	3 IN	6.0	3 IN			
OVER 20	NOTE 1										

Footnotes to tables, general notes on hydraulic shoring, are found in Appendix D, Item (g)

Notes (1): See Appendix D, Item (g) (2)

Notes (2): See Appendix D, Item (g) (2)

* Consult product manufacturer and/or qualified engineer for Section Modulus of available wales.

** Douglas fir or equivalent with a bending strength not less than 1500 psi.

**Appendix F to Section 1541.1
Selection of Protective Systems**

The following figures are a graphic summary of the requirements contained in Article 6 for excavations 20 feet in depth must be designed by a registered professional engineer in accordance Section 1541.1(b) and (c).

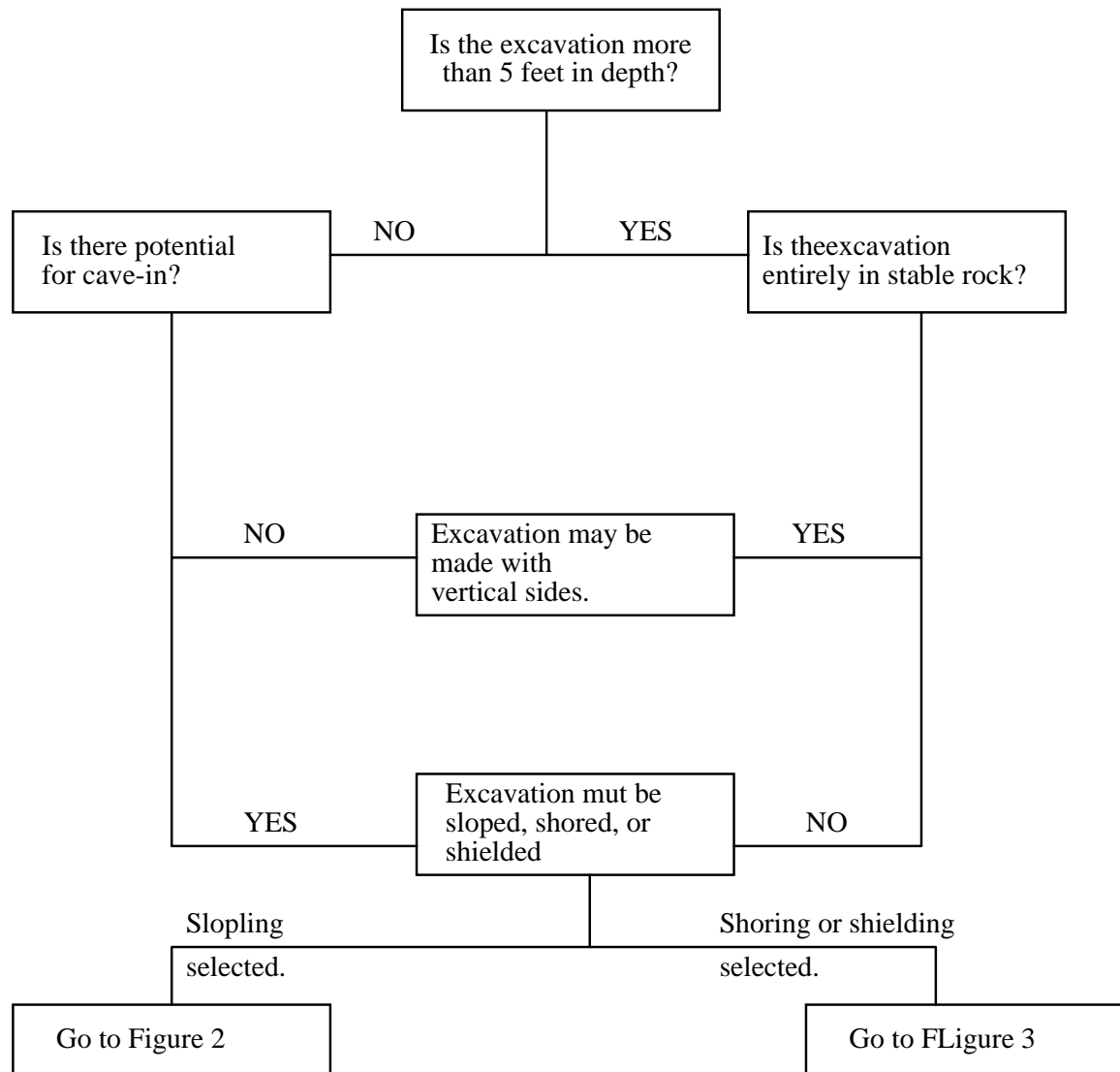


FIGURE 1 - PRELIMINARY DECISIONS

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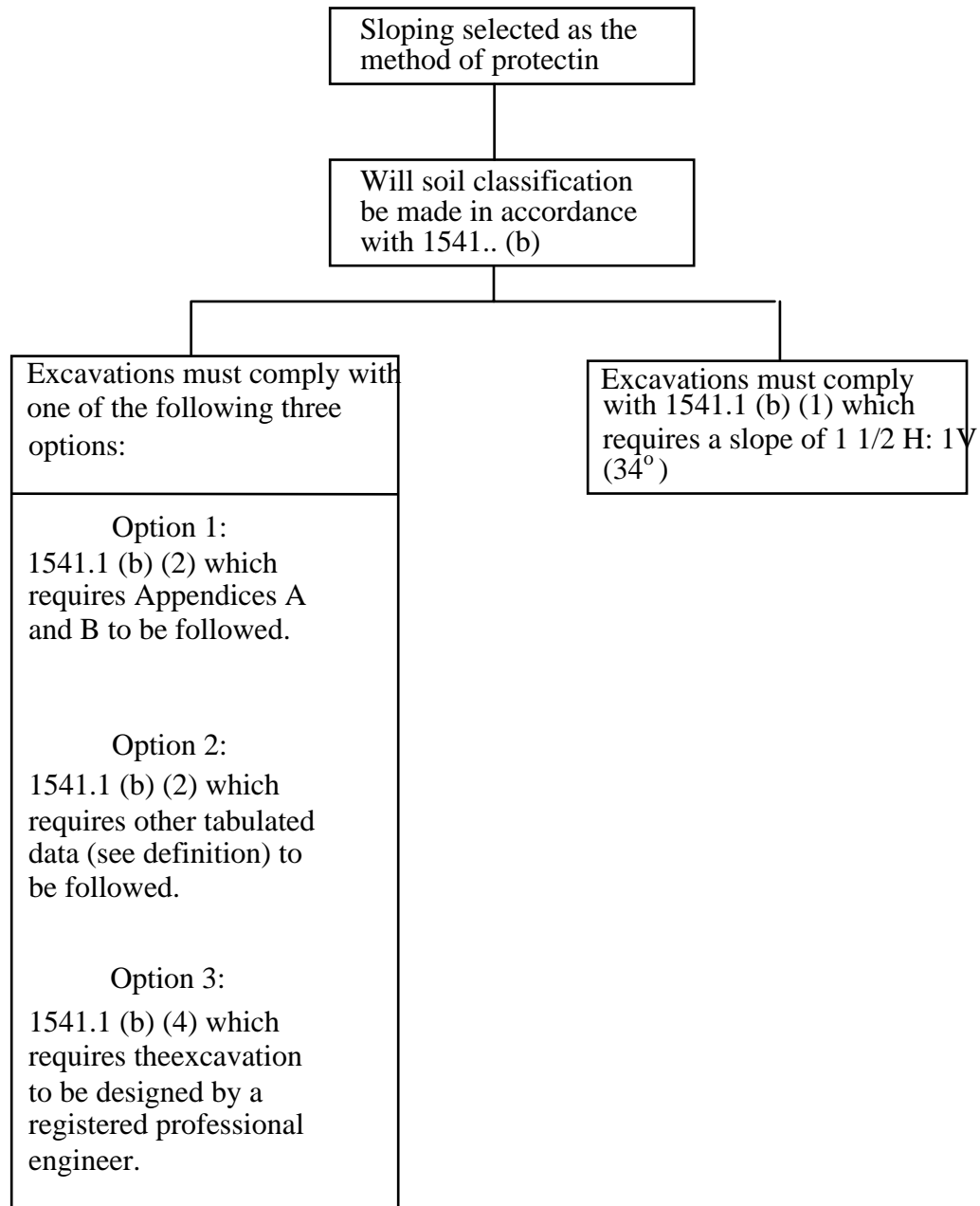


FIGURE 2 - SLOPING OPTIONS

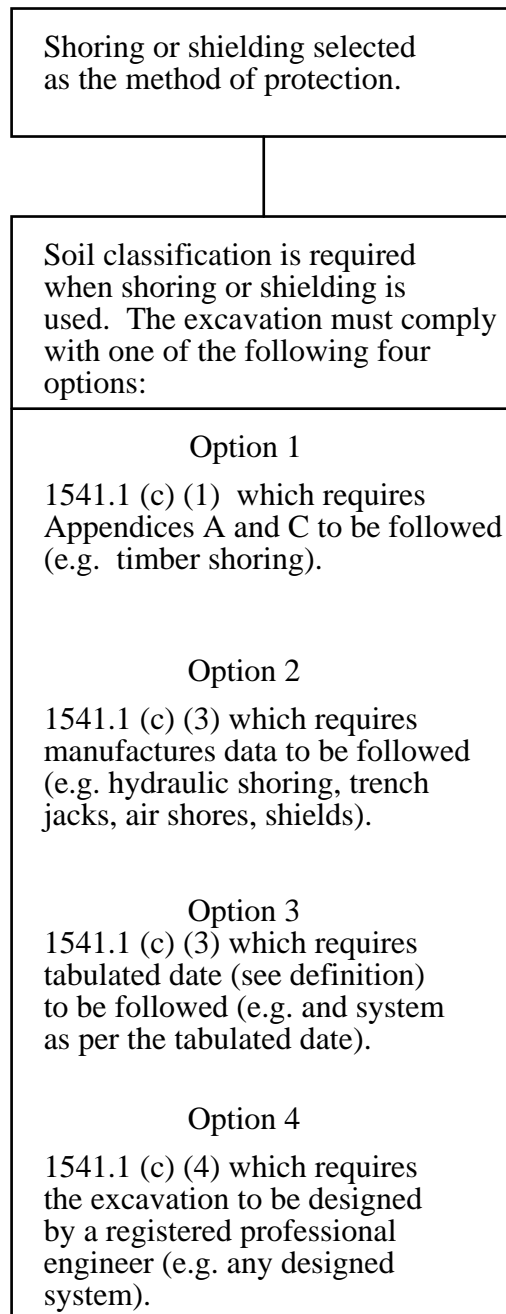


FIGURE 3 - SHORING AND SHIELDING OPTIONS

Note authority cited: section 142.3, labor Code. Reference: Section 142.3, Labor Code.

Definitions applicable to this article.

Accepted engineering practices means those requirements which are compatible with standards of practice required by a registered professional engineer.

Aluminum hydraulic shoring. A pre-engineered shoring system comprised of aluminum hydraulic cylinders (crossbraces) used in conjunction with vertical rails (uprights) or horizontal rails (walers). Such system is designed specifically to support the sidewalls of an excavation and prevent cave-ins.

Bell-bottom pier hole. A type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a belled shape.

Benching (Benching system). A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

Cave-in. The separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

Cross braces. The horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.

Excavation. Any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Faces or sides. The vertical or inclined earth surfaces formed as a result of excavation work.

Failure. The breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.

Hazardous atmosphere. An atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

Kick out. The accidental release or failure of a cross brace.

Protective system. A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent

structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Ramp. An inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or from structural materials such as steel or wood.

Registered professional engineer. A person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a “registered professional engineer” within the meaning of this standard when approving designs for “manufactured protective systems” or “tabulated data” to be used in interstate commerce.

Sheeting. The members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shield (Shield system). A structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either premanufactured or job-built in accordance with Section 080:©(3) or ©(4). Shields used in trenches are usually referred to as “trench boxes” or “trench shields.”

Shoring (Shoring system). A structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sides. See “Faces.”

Sloping (Sloping system). A method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Stable rock. Natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

Structural ramp. A ramp built of steel or wood, usually used for vehicle access. Ramps made of soil or rock are not considered structural ramps.

Support system. A structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Tabulated data. Tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench (Trench excavation). A narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet. If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet or less, (measured at the bottom of the excavation), the excavation is also considered to be a trench.

Trench box. See “Shield.”

Trench shield. See “Shield.”

Uprights. The vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called “sheeting.”

Wales. Horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or earth.

HEAT ILLNESS PREVENTION PROGRAM



NASA via Newsmakers

WHAT IS HEAT ILLNESS?

Heat Illness, also known as heat stress, is caused by working in extreme hot conditions. There are four environmental factors that can cause heat stress. These include:

- Temperature
- Radiant heat from the sun or a furnace
- Humidity
- Air velocity

Heat Illness occurs when your body keeps in more heat than it loses and your temperature rises. Most often, your body muscles are being used for physical labor and less blood is available to flow to the skin and release the heat. You are more susceptible to heat illness if you are dehydrated, are not use to working in the heat, have poor health and/or have had heat illness before. Personal factors such as weight, age, medical condition, use of medications and alcohol, level of fitness, and acclimatization affect how well the body deals with excess heat.

Some of the risks involved with heat illness include a rise in body temperature and heart rate. Another risk is loss of concentration and difficulty in focusing on a task. Some may see an increase in irritability or sickness. Some people tend to have little or no desire to drink; because of this symptom you are encouraged to drink fluids often. Fainting and possible death can occur if a person is not removed from the source of the heat stress.

SYMPTOMS AND SOLUTIONS FOR HEAT ILLNESS

Heat Illness is to be taken very seriously as it can progress to heat stroke and be fatal, especially when emergency treatment is delayed. Supervisors and foremen should look continuously for symptoms and signs of heat stress-related disorders in employees. The following include some of the symptoms of heat stroke including solutions for each heat illness disorder.

Disorder	Symptoms	Solution
Heat Stroke: The most serious health problem for workers in a hot environment is caused by the body's failure to regulate its core temperature. Sweating stops and the body can no longer release excess heat. Victims of heat stroke usually die unless treated promptly.	<ul style="list-style-type: none"> • Mental Confusion, delirium, loss of consciousness, convulsions, or coma. • Body Temperature of 104°F or higher. • Hot, dry skin that may be red, mottled, or bluish 	Immediately call for medical assistance. Prompt first aid and medical treatment can prevent permanent injury to the brain and other vital organs. While awaiting medical help, the victim should be moved to the coolest, shadiest spot available, fanned vigorously and the victim's skin and clothing should be gradually soaked with cool water.
Heat Exhaustion: This results from loss of fluid through sweating and from not drinking enough replacement fluids.	<ul style="list-style-type: none"> • The worker still sweats but experiences extreme weakness or fatigue, dizziness, nausea, blurred vision, or headache. • The skin is clammy and moist, while the body temperatures are normal or slightly elevated. 	The victim should rest in a cool place and drink water or an electrolyte solution, such as Gatorade or similar beverages used by athletes to restore potassium and salt. Severe cases, in which the victim vomits or loses consciousness, may require longer treatment under medical supervision.
Heat Cramps: These are painful spasms of the muscles that are caused by the body's loss of salt.	<ul style="list-style-type: none"> • Muscle Spasms • Vomiting • Loss of consciousness 	As in the case of heat exhaustion, a victim of heat cramps should drink an electrolyte solution such as Gatorade. Seek medical attention in the case of severe cramping, vomiting, or loss of consciousness.
Fainting: This can occur when a worker is not acclimatized to a hot environment.	<ul style="list-style-type: none"> • Loss of consciousness • Loss of balance • Dizziness 	At first, allow the victim to lie down on his or her back. When consciousness has been regained, the victim should recover after a brief period of walking around slowly. Immediate return to work in the heat is not advisable as heat stress may recur.
Heat Rash: Also known as prickly heat, can be extensive and can be complicated by infection. Heat rash can be so uncomfortable that sleep is disrupted. It can impede a worker's performance and even result in a temporary total disability.	<ul style="list-style-type: none"> • Red bumps or red patches on the skin. • Irritable and itchy skin 	Place the victim in a cool place and allow the skin to dry.

*Note: In all cases victim should be moved to a cool and shaded area.

TASKS TO PREVENT HEAT ILLNESS



1. Recognize the Hazard

When working in heat conditions, it is important to realize there is always a concern for heat illness. If an employee starts to feel the following symptoms, they are to report it to the supervisor immediately.

- Nausea
- Dizziness
- Weakness
- Unusual fatigue
- Discomfort
- Excessive sweating
- Headache
- Poor concentration
- Muscle pain
- Cramping
- Dizziness
- Fatigue
- Irritability
- Loss of coordination
- Blurry vision
- Confusion
- Lack of sweating
- Fainting
- Seizures

The next step is to find a cool shaded area and rest until symptoms are gone. If symptoms persist or worsen seek immediate medical attention. Employees are trained to recognize heat illness symptoms in themselves and their co-workers.

If an employee is new to working in the heat he or she is to tell their employer. The employer will use the following procedures to allow the employee to adjust during the first two weeks of hot weather work.

- Employee will be trained on heat stress practices and precautions.
- The supervisor on site will follow up with the new employee every couple of hours to look for signs of heat stress.
- Employee will be encouraged to take many breaks in the shade where he or she is to drink more fluid than the average employee.
- The supervisor will review employee clothing and train employee on proper clothing for weather conditions.

2. Water

Employees are required to drink at least 4 eight-ounce glasses of water per hour, including at the start of the shift, in order to replace the water lost to sweat. The employer will provide at least two gallons of water per person for an eight hour shift. Employees are encouraged to drink water often, and not wait until they are thirsty to drink. Try to avoid or limit the use of alcohol and caffeine during periods of extreme heat as both dehydrate the body. All employees will know where the locations of their closest drinking water supplies are.

3. Shade and Rest Breaks

Shade will be provided for all employees for recovery periods when relief is needed from the heat. The direct heat of the sun can add as much as 15 degrees to the heat index of a person's body. This can lead to heat illness. Rest breaks will be provided to cool down and drink water. Breaks will be taken in cooler, shaded areas. Employees may slow the work pace or reduce the work load and stop and rest if they become extremely uncomfortable.

If you are coming back to work from an illness or an extended break or just starting a job working in the heat, it is important to be aware that you are more vulnerable to heat stress until your body has time to adjust.

4. Clothing and other forms of Protection

Employees should wear appropriate clothing that provides protection from the sun, but allows airflow to the body such as cotton garments. They are encouraged to wear sunscreen, hats and sunglasses.

5. Prompt Medical Attention

First aid workers will be trained to recognize and treat heat stress disorders. The names of staff trained in first aid will be known to all workers. If first aid trained personnel are not immediately available on-site to make an assessment and workers show any abnormal response to the heat, you should call 911 immediately. Regardless of the worker's protests, no employee with any of the symptoms of possible serious heat illness noted above should be sent home or left unattended without medical assessment and authorization.

All supervisors will have medical numbers, and phone accessibility or other communication venues available to them at all times. In the event that medical attention is needed, the supervisor will contact the medical response team and give them clear and accurate directions to the worksite.

ACKNOWLEDGMENT OF RECEIPT AND UNDERSTANDING

I have received a copy of the Job Safety Handbook from Environmental Products & Applications, Inc.. I acknowledge my obligation to read, understand, and follow with its contents and directives. The handbook contains the following sections:

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NAME (PRINT): _____

Signature _____ Date: ____/____/____

